LOUISIANA DEPARTMENT OF WILDLIFE & FISHERIES

OFFICE OF FISHERIES
INLAND FISHERIES SECTION

PART VI -B

WATERBODY MANAGEMENT PLAN SERIES

BAYOU D'ARBONNE LAKE

WATERBODY EVALUATION &
RECOMMENDATIONS

CHRONOLOGY

DOCUMENT SCHEDULED TO BE UPDATED ANNUALLY

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WATERBODY EVALUATION

STRATEGY STATEMENT

Recreational

Sportfish species are managed to provide a sustainable population while providing anglers the opportunity to catch or harvest numbers of fish adequate to maintain angler interest and efforts. Bass anglers are afforded the opportunity to catch trophy fish through the introduction of Florida largemouth bass. Sunfish and crappie are managed under the maximum sustained yield design, which is expected to produce adequate forage for largemouth bass and adult fish for anglers.

Commercial

The physical characteristics of D'Arbonne Lake do not support most large rough fish species that normally comprise a commercial fishery. The exceptions are flathead (*Pylodictis olivaris*) and channel catfish (*Ictalurus punctatus*), which are managed to provide both recreational and commercial value.

Species of Special Concern

No threatened or endangered fish species are found in this waterbody.

EXISTING HARVEST REGULATIONS

Recreational

Statewide regulations are in effect for all fish species. The recreational fishing regulations may be viewed at the link below:

http://www.wlf.louisiana.gov/fishing/regulations

There are no special creel or length regulations on D'Arbonne Lake, though special regulations exist for the use of yo-yo's and trot lines (see D'Arbonne Lake MP-A).

Commercial

The commercial fishing regulations may be viewed at the link below:

http://www.wlf.louisiana.gov/fishing/regulations

Use of gill nets, trammel nets and fish seines is prohibited.

SPECIES EVALUATION

Recreational

LDWF fish sampling was initiated in D'Arbonne Lake in 1964 with block-off net rotenone sampling. Rotenone sampling was conducted to gain insight into the overall fish population. Sampling sites were blocked off with large ¼" mesh nylon net. The net enclosed one acre areas and was deep enough to extend from the surface to the lake bottom. Eight to twelve of the one acre samples were conducted in a sample year, all during the summer months. D'Arbonne Lake rotenone sampling was conducted in the years of 1964-1974, 1976-1988, 1991, and 1995.

Standardized sampling was initiated in 1989 with electrofishing. As with any fish sampling technique, electrofishing is influenced by environmental factors that can create significant variance in results. Accordingly, LDWF sampling is standardized to the greatest extent possible and analyzed over long periods of time to establish population trends.

Largemouth Bass

Largemouth bass *Micropterus salmoides* are targeted as a species indicative of the overall fish population due to their high position in the food chain. Electrofishing is the best indicator of largemouth bass abundance and size distribution, with the exception of large bass. Gill net sampling is used to determine the status of large bass and other large fish species. Shoreline seining is used to collect information related to fish reproduction.

Largemouth Bass relative abundance and size distribution-

In the chart below (Figure 1), springtime electrofishing data is used as an indicator of largemouth bass abundance with total catch per unit effort (CPUE = *bass per hour*) indicated since 1993. Sampling is conducted in the spring and fall on a bi-annual basis. Annual sampling was conducted from 1999-2003 and also from 2010 – 2012 for the largemouth bass stock assessment study. A summary of this report is found in Appendix A. Greater sampling effort was made during this study, thus the CPUE figures may be more precise during these years. Figure 1 suggests stable largemouth bass abundance from 1993 through 2014 for all size groups, with the exception of a significant peak in the years of 1999 and 2000. There is also a noticeable upward trend for stock and quality-size bass from 2007 - 2012, while preferred-size bass have remained stable.

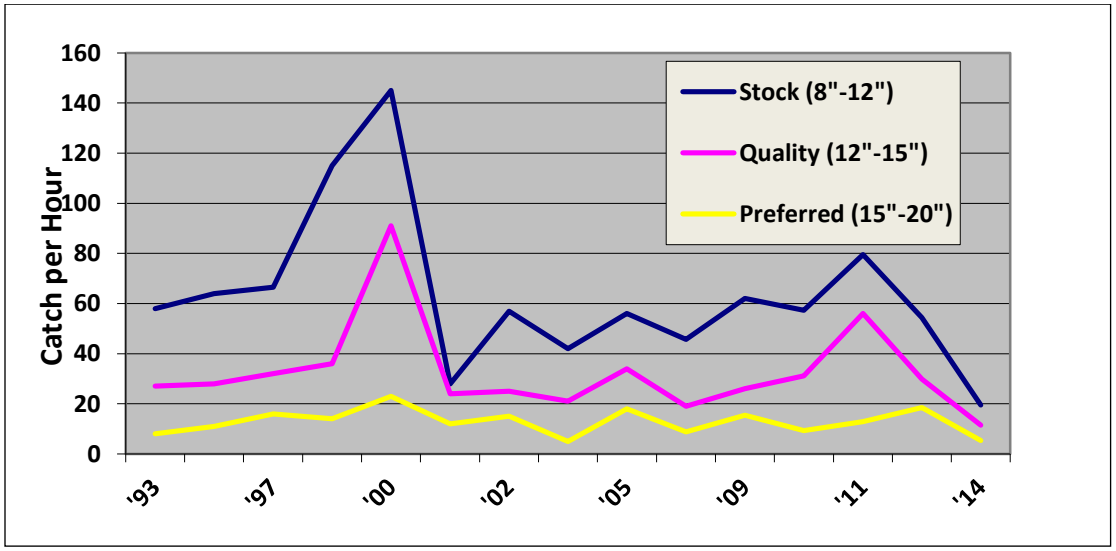


Figure 1. CPUE (bass per hour) for stock-, quality- and preferred-size largemouth bass from D'Arbonne Lake spring electrofishing samples, 1993 – 2014.

A more detailed perspective is provided in the following series of size distribution histograms taken from the years 2007 – 2014 (Figures 2, 3, 4, 5, 6 and 7) of which years 2010 – 2012 were analyzed for the largemouth bass stock assessment. Exceptional recruitment cohorts are indicated from the years 2007 and 2009. The combination of factors that contributed to the increase is unidentified at this time. The 2010 and 2011 size frequency charts show a more

normally distributed population, with the most abundant size classes being near the middle of the distribution. The 2012 and 2014 distributions also indicate exceptional recruitment.

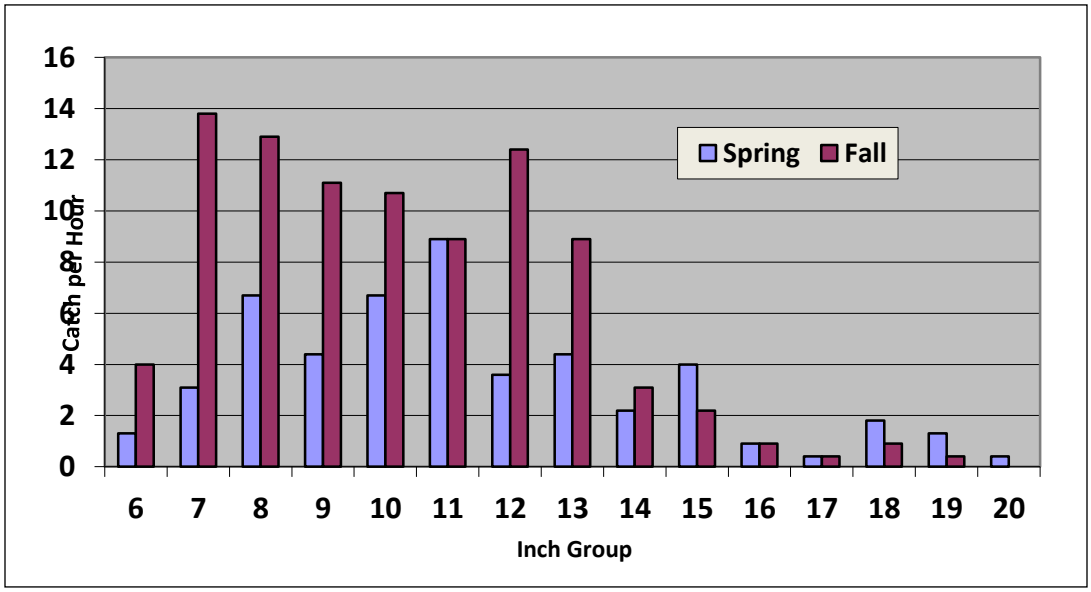


Figure 2. Size distribution of largemouth bass from D'Arbonne Lake, LA from 2007 spring (n=113) and fall (n=215) electrofishing samples.

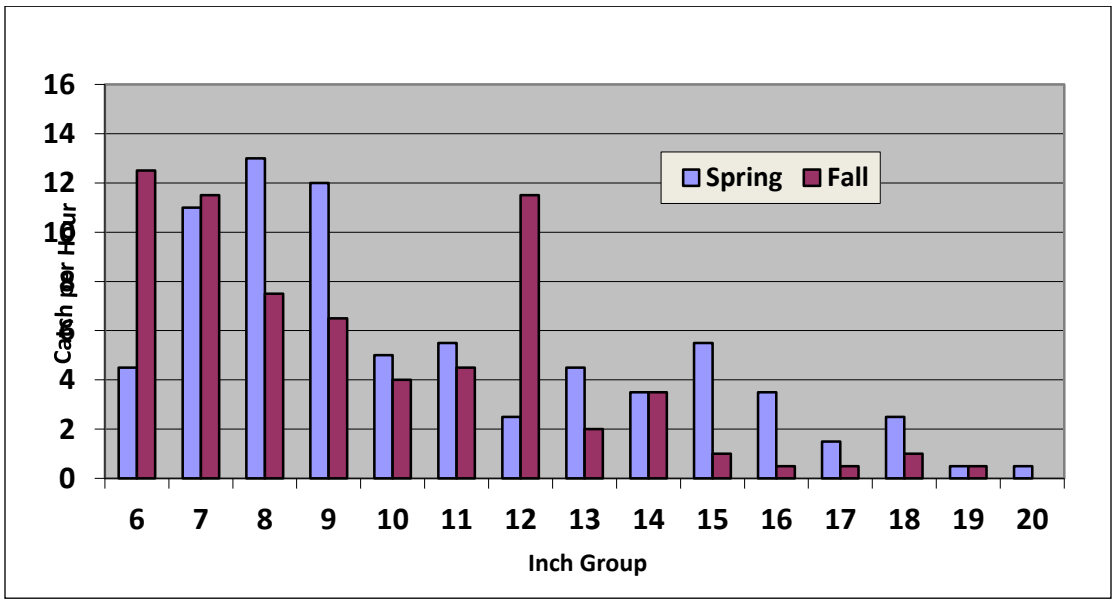


Figure 3. Size distribution of largemouth bass from D'Arbonne Lake, LA from 2009 spring (n=158) and fall (n=145) electrofishing samples.

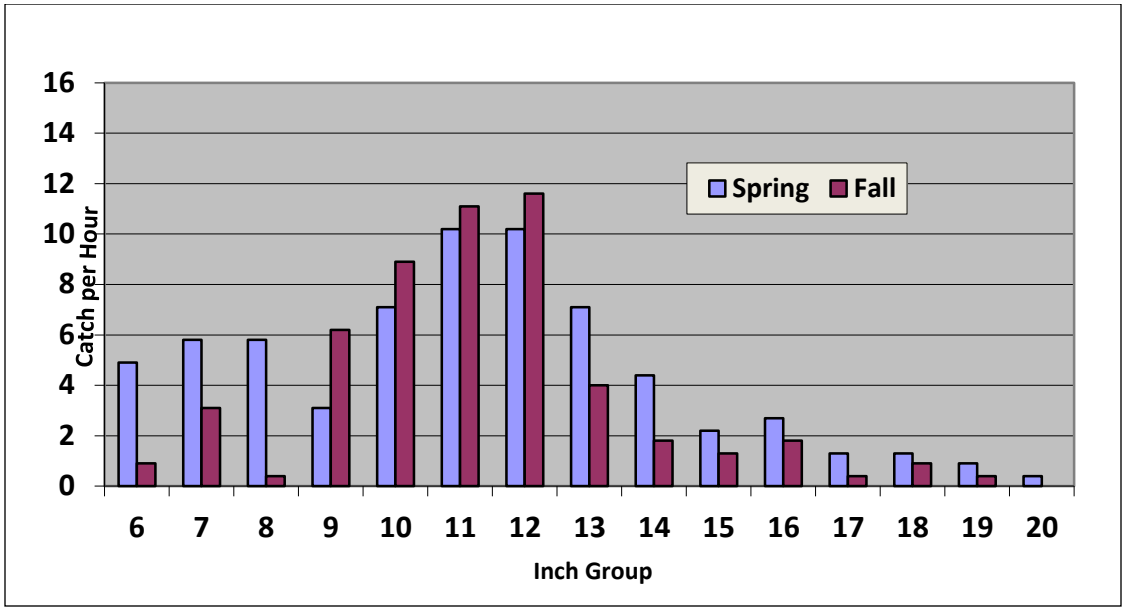


Figure 4. Size distribution of largemouth bass from D'Arbonne Lake, LA from 2010 spring (n=160) and fall (n=132) electrofishing samples.

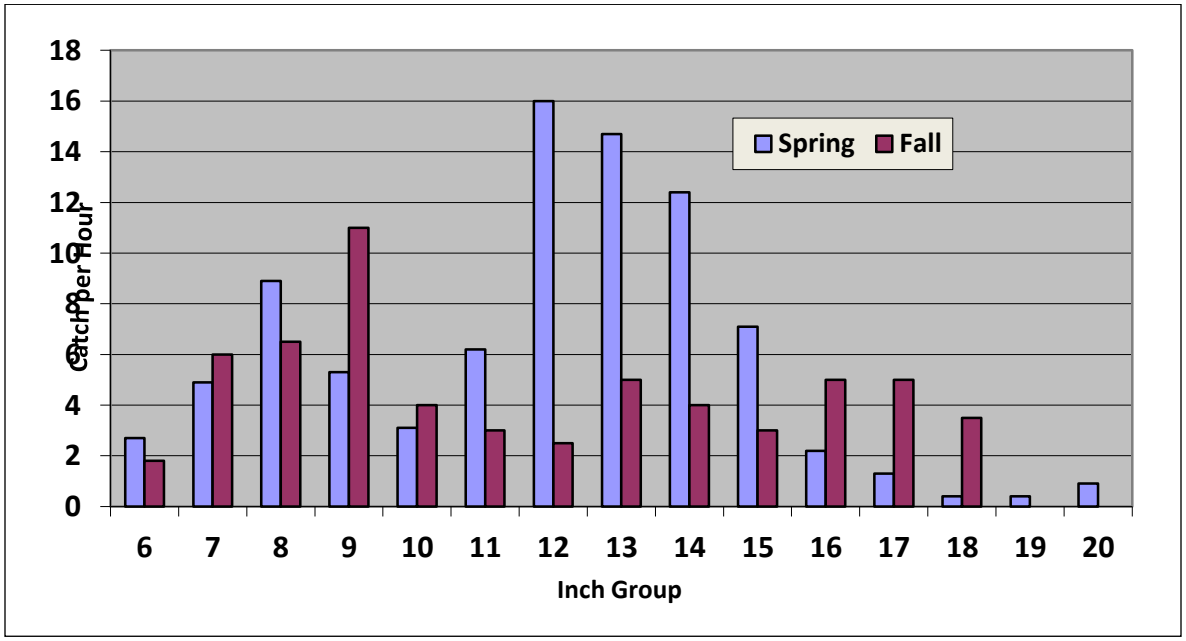


Figure 5. Size distribution of largemouth bass from D'Arbonne Lake, LA from 2011 spring (n=205) and fall (n=186) electrofishing samples.

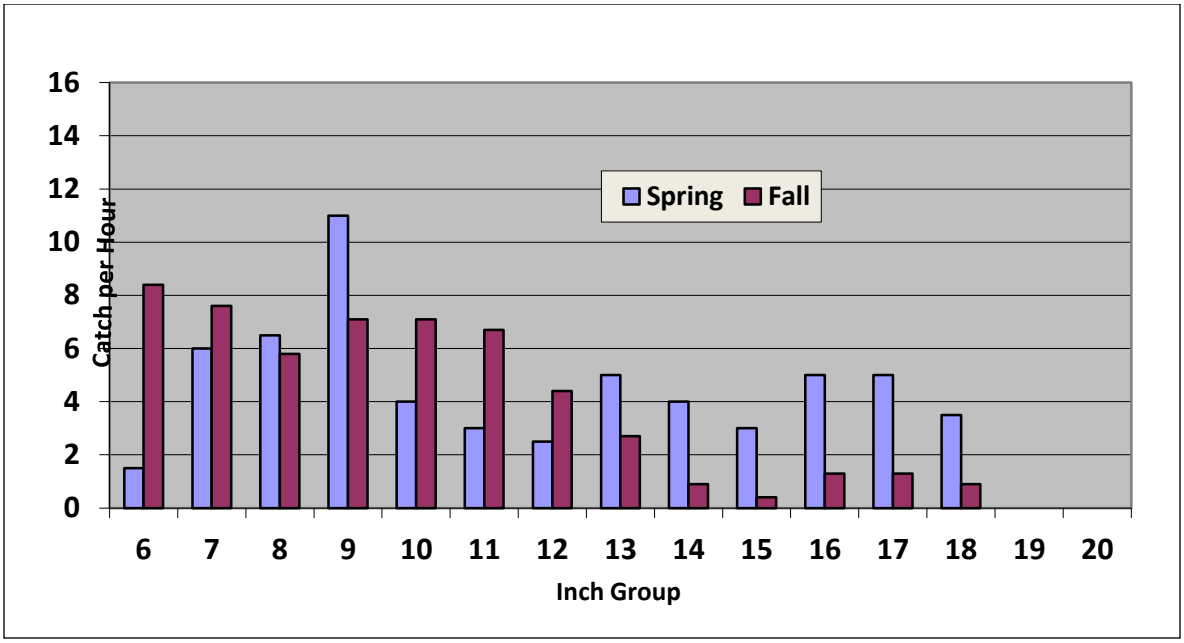


Figure 6. Size distribution of largemouth bass from D'Arbonne Lake, LA from 2012 spring (n=129) and fall (n=132) electrofishing samples.

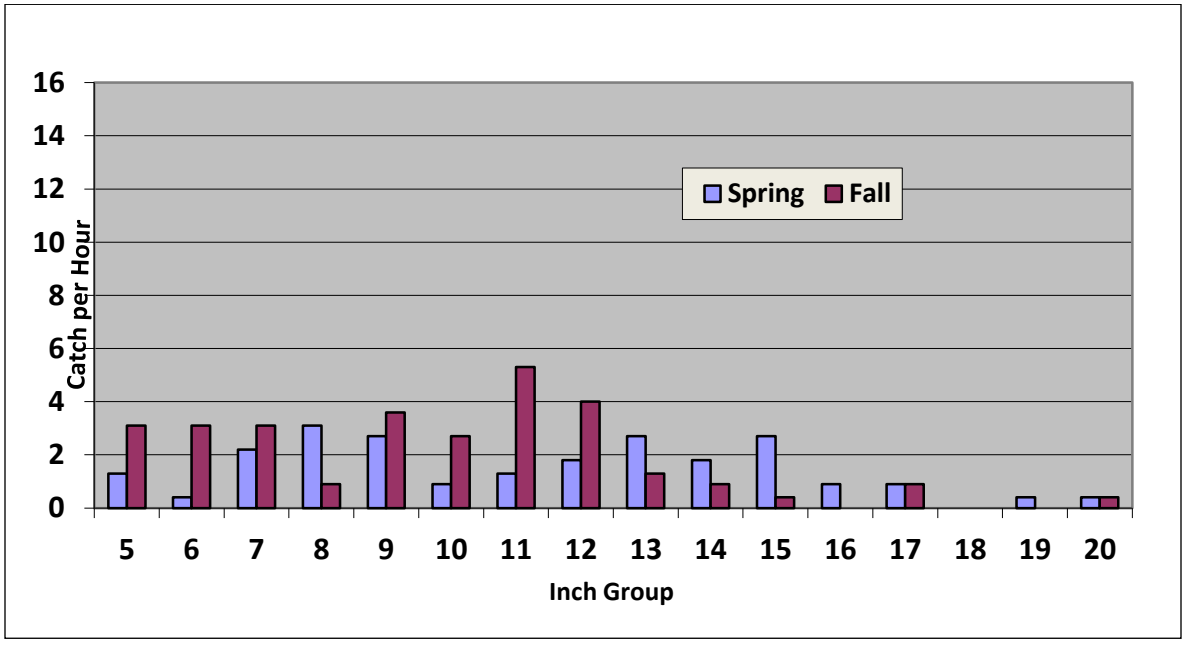


Figure 7. Size distribution of largemouth bass from D'Arbonne Lake, LA from spring 2014 (n=129) and fall (n=132) electrofishing samples.

Proportional stock density (PSD) and relative stock density (RSD) are indices used to numerically describe length-frequency data. Proportional stock density compares the number of fish of quality size (greater than 12 inches for largemouth bass) to the number of bass of stock

size (greater that 8 inches in length). The PSD is expressed as a percent. A fish population with a high PSD consists mainly of larger individuals, whereas a population with a low PSD consists mainly of smaller fish. A value between 40 and 70 generally indicates a balanced bass population. For example, the chart below (Figure 8) indicates a PSD of 70 for 2011. The number 70 indicates that 70% of the bass stock (fish over 8 inches) in the sample was at least 12 inches or longer.

$$PSD = \frac{\text{Number of bass>12 inches}}{\text{Number of bass>8 inches}} \text{ x100}$$

Relative stock density (RSD_{15}) is the proportion of largemouth bass in a stock (fish over 8 inches) that are 15 inches or longer. A value between 10 and 40 indicates a proportionate number of bass greater than 15 inches in the population. The chart below indicates a RSD_{15} of 16 for 2011. The number 16 indicates that 16% of bass over 8 inches in the sample were at least 15 inches or longer.

$$RSD_{15} = \frac{\text{Number of bass>15 inches}}{\text{Number of bass>8 inches}} \text{ x100}$$

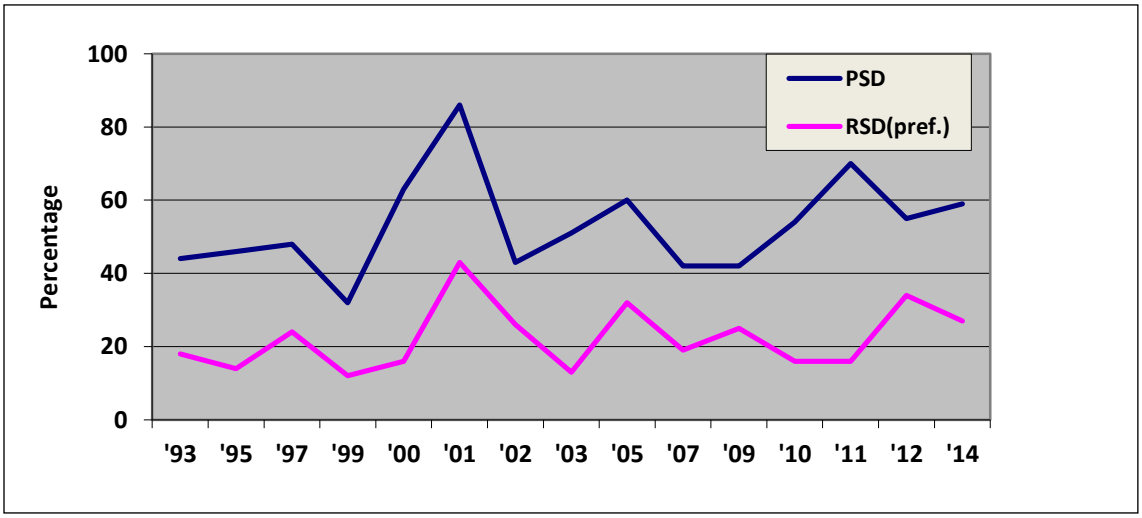


Figure 8. Proportional stock density and relative stock density (preferred) for largemouth bass collected from D'Arbonne Lake, LA during spring electrofishing from 1993 – 2014.

Largemouth bass genetics-

Introductions of Florida bass into D'Arbonne Lake began in 1985. The early stockings were primarily made in response to request from anglers for increased trophy potential. In 1992, proceeds from a local bass tournament were dedicated to the purchase of Florida bass *M. floridanus* fingerlings for D'Arbonne Lake. Because of the small number of fish involved, increased efforts were made to achieve maximum stocking efficiency. The fingerlings were divided into smaller groups and stocked throughout the impoundment in sites that afforded protective cover. The technique was successful and has been adopted for all subsequent fish stockings. Table 1 shows the history of Florida bass stockings into D'Arbonne Lake.

Table 1. History of Florida largemouth bass stocking and largemouth bass genetic analyses in D'Arbonne Lake, Louisiana from 1985 – 2012.

D'ARBONNE LAKE							
FLMB STOCKING			LARGEMOUTH BASS GENETICS SAMPLING				
YEAR	NUMBER STOCKED		SAMPLE SIZE	GENOTYPE %			% BASS WITH FLORIDA GENETICS
1985	75,000		N	NORTHERN	FLORIDA	HYBRID	
1987	75,000						
1992	4,000						
1995	138,143						
1999	140,728						
2000	158,476		81	68	2	11	13
2001	163,239						
2002	75,456		84	74	0	10	10
2003	135,841		69	61	2	6	8
2004	135,841						
2005	149,481		100	84	0	16	16
2007	151,024						
2008	87,142						
2009	85,142						
2010	17,141		145	80	18	2	20
2011	151,734		229	84	14	2	16
2012	150,990		186	84	14	2	16

Largemouth bass age & growth-

Largemouth bass collected during fall sampling are used for age and growth analysis. Sagittal otoliths are removed from at least 10 individuals from each inch group and cut in transverse sections to reveal annuli. Comparison of length and age are used to determine growth rate.
Largemouth bass age and growth data have been collected and analyzed by district personnel in the years 1995, 1999, 2002, 2005, and 2009. Largemouth bass growth data collected during fall 2005 and 2009 are presented in Figure 9. Statewide age and growth analysis became centralized when the largemouth bass stock assessment was initiated in 2010. Otoliths for this study are collected during spring sampling. Mean length-at-age estimates were determined from the stock assessment study are shown in **Appendix A**. Lengths at age are very similar to the statewide average.

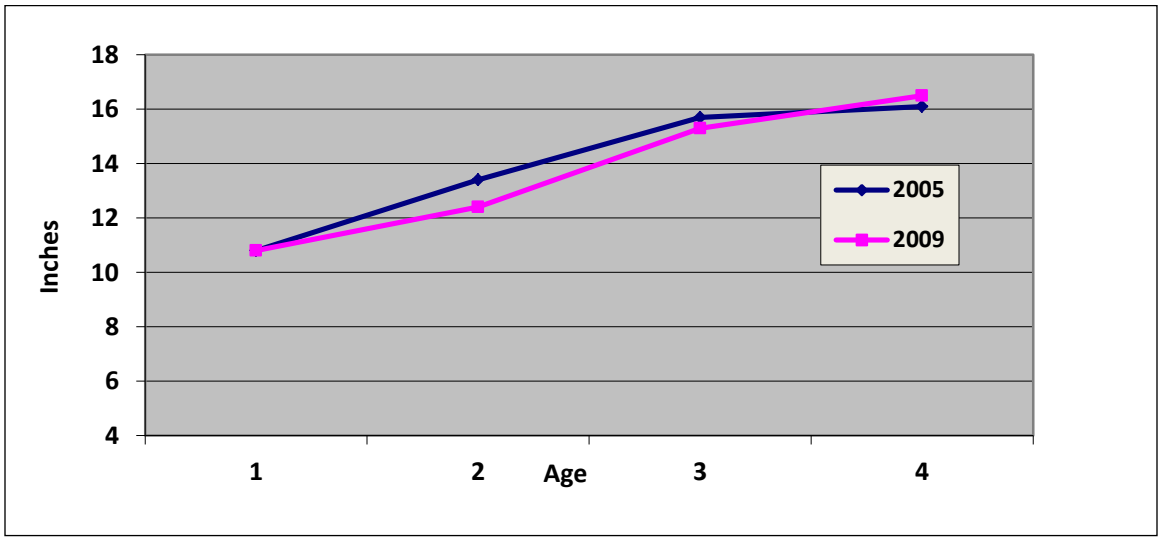


Figure 9. The mean length at capture for largemouth bass collected from D'Arbonne Lake, LA during fall electrofishing from 2005 and 2009.

Largemouth Bass Stock Assessment

Appendix A includes a summary of the largemouth bass stock assessment report prepared by West et al. (2013). The study was conducted from 2010 – 2012, and included intensive sampling and an access point creel survey to describe angler participation and habits. The purpose of the study was to obtain accurate estimates of length distribution, age composition, and growth and mortality rates of the largemouth bass population. This information was used to determine if alternative regulations would have a desired effect on the population. It was determined that any length or creel restrictions would have had an insignificant effect on the population.

Forage

Sunfish, threadfin shad, inland silversides, bullhead minnows, taillight shiners, and crawfish have been identified as primary bass forage items in D'Arbonne Lake. Forage availability is measured through shoreline seine sampling, electrofishing sampling conducted during the fall, and indirectly through measurement of largemouth bass body condition or relative weight. Relative weight (Wr) is the ratio of a fish's weight to the weight of a ''standard'' fish of the same length (Table 2).

Table 2. Standard weights for various length largemouth bass

Length (inches)	Standard Weight (lbs)
10	0.5
11	0.7
12	0.9
13	1.1
14	1.5
15	1.8
16	2.2
17	2.7
18	3.2
19	3.9
20	4.5
21	5.3

The index is calculated by dividing the weight of a fish by the standard weight for its length, and multiplying the quotient by 100. As an example, the Wr of a 15 inch, 1.5 pound bass would be calculated as per the following:

Standard weight for a 15" bass = 1.8 lbs
Relative weight = 1.5 / 1.8 = 0.83

Poor largemouth bass body condition (Wr < 80) may indicate a potential problem with forage availability. Relative weights for D'Arbonne Lake largemouth bass typically measure around 100 in all size groups indicating sufficient forage, available to predation (Fig. 10).

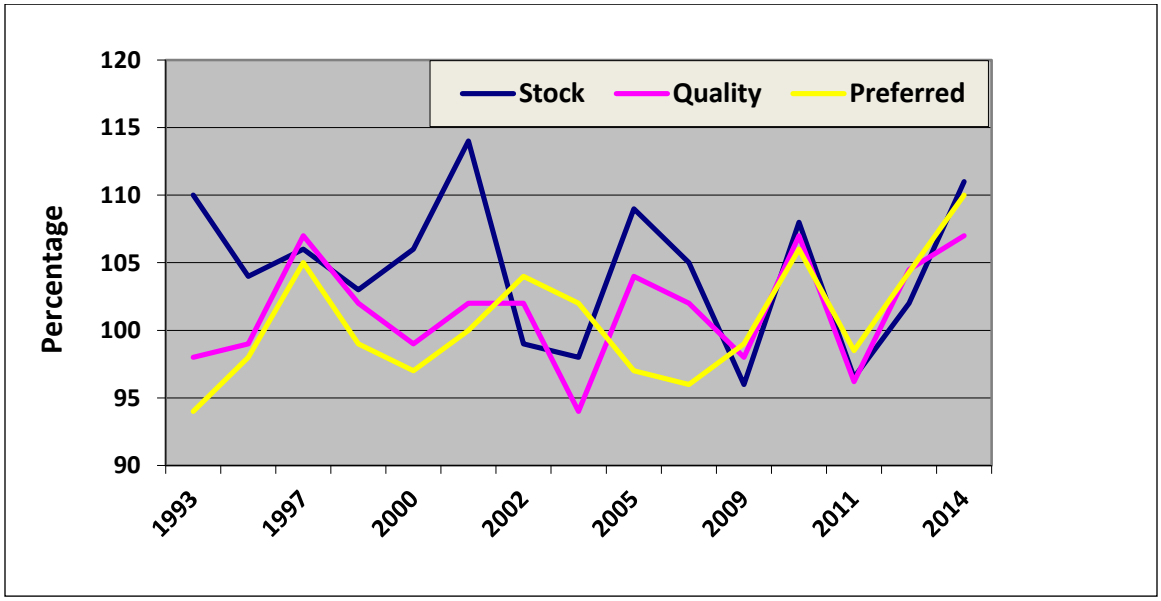


Figure 10. Relative weights for stock- (8-12 in.), quality- (12-15 in.), and preferred-size (15-20 in.) largemouth bass collected from D'Arbonne Lake, LA during fall electrofishing from 1993 – 2014.

Crappie

From 1964 through 1995, rotenone sampling was used to indicate status of crappie (*Pomoxis spp.*) and sunfish (*Lepomis spp.)* populations in D'Arbonne Lake. Number of crappie over 7 inches in length from 1980-1991 were estimated to be approximately 5 per acre. Number of bluegill over 5 inches in length from 1980-1991 were estimated to be approximately 50 per acre.

In 1991, frame nets were adopted in LDWF Standardized Sampling Procedures as gear to be used to collect data related to relative abundance and length frequencies of crappie and sunfish populations. Unfortunately, data collected through the use of frame nets was questionable, in that it was not believed to be representative of the sampled population. Those concerns lead to testing and development of a new gear as described below in several North Louisiana water bodies, including D'Arbonne Lake.

Comparison of Frame Nets with Hoop Nets with Lead Lets

Questions: With the gear types currently used to assess fish populations (frame nets, gill nets, electrofishing, and rotenone), is the CPUE of crappie high enough to provide an accurate appraisal of population characteristics? Are the current gear types creating bias for certain length groups within a population?

Need: A sampling technique is needed that will provide maximum CPUE for man-hours expended and will provide unbiased data for at least some length groups of crappie.

Hypothesis: When set correctly, lead nets have the potential to provide adequate catches of crappie, and would be more efficient than frame nets in providing data needed to assess crappie populations.

Study Design:

The sampling design will compare crappie harvests between two frame nets (connected by a mesh panel), which is the current standardized sampling method, and four lead nets (each composed of two nets connected by a mesh panel) of different mesh sizes. All nets will be fished at the same time, for the same duration, in the same habitat (depth, substrate, structure, vegetation, etc.). This sampling design should eliminate as much as possible all variables except gear type for comparing crappie abundance and size structure. The location in the lake where the six gears (four lead nets and two frame nets) are fished will be defined as a station. At each station, it would be preferable that the lead nets and frame nets are located at sufficient intervals along the lake shoreline to preclude catch interference between nets, i.e., during the course of normal daily movements, each fish would encounter only one net. However, biotelemetry studies of crappie movements in South Dakota lakes (D. Willis, South Dakota State University, personal communication) indicate that home ranges of these species may average 15 ha (up to several hundred ha for black crappie); spacing nets far apart will likely increase the chances of habitat differences among net sets. We prefer to minimize habitat differences among net locations by locating nets about 50-m apart along the shoreline; any bias resulting from net interference (e.g., the nets on each end catch the most fish) should be minimized by randomly ordering the nets along the shoreline during each sampling period (the ordering of the nets will be recorded during each sampling period to test for net location effects).

Gears:

As prescribed by standardized sampling methods, the two frame nets will be constructed of ½" bar (1" stretched) mesh. Each will have a 65'lead constructed of 0.5"mesh. Each lead net will be made up of two hoop nets separated by a 30' lead of the same mesh size. The four lead nets will be constructed from ½" bar (1" stretched), 1" bar (2" stretched), 1 ½ bar (3" stretched), and 2" bar (4" stretched) mesh. The hoop nets at either end of the lead net will have two throats and will be 16 feet long with 6 steel hoops (the diameter of the front hoop in each net will be 3 ½ feet); all nets will be tied with #9 nylon twine and treated with netcoat. .

Field Methods:

All nets will be fished during the same time period for approximately 72 hours at one station in the lake. All captured fish will be weighed (g) and measured (mm), with data recorded for each gear by lake, station, net order, date and sample time in hours. If all nets are fished for a similar 72-hour period, catch data will be used as is. If sample times vary, catch will be expressed as CPUE (per hour, 24-hour period, etc.) for statistical comparisons.

Statistical design:

In order to simplify comparisons among gears, all fish within a species will be grouped into stock, quality, preferred, memorable, and trophy size groups. Catch will be compared between gear configurations with a series of paired t-tests for each size group:

1. The combined catch from both frame nets versus the combined catch from the four lead nets;
2. All pairwise comparisons of the four lead nets;
3. Pairwise comparisons of the combined catch from frame nets versus each of the four lead nets.

The above comparisons should permit determination of the relative effectiveness of the various net configurations in catching crappie, the size classes of crappie that are most effectively captured by the various gear types, and the most cost effective and efficient gear type for routine standardized sampling of Louisiana crappie populations.

Expressed as the number of crappie (by size groups, if desired) captured per man-hour of effort (deployment and retrieval times for frame or lead nets), these data could also be compared (at least qualitatively) with crappie catch data collected with electrofishing gear (number captured per man-hour of electrofishing time), gill nets (number captured per man-hour of net deployment and retrieval), and rotenone (number captured per man-hour of block net deployment, rotenone application, and fish pick-up). These comparisons would provide additional information concerning personnel management and the most efficient way to obtain representative data for development of crappie management plans.

The comparisons documented that lead nets are a more effective gear for sampling crappie and sunfish and are an efficient alternative to frame nets. Results of the study are pending publication. Future crappie and sunfish sampling will be conducted with the use of standardized lead nets.

In the period, November 2002–January 2003, D'Arbonne Lake crappies were captured in frame nets and various size lead nets for age and growth analysis. Ages of 142 fish were determined through sagittal otolith analysis (Figure 10). The oldest crappie in the sample was determined to be 9 years of age. The largest individual was 15.4" and 2.31 pounds.

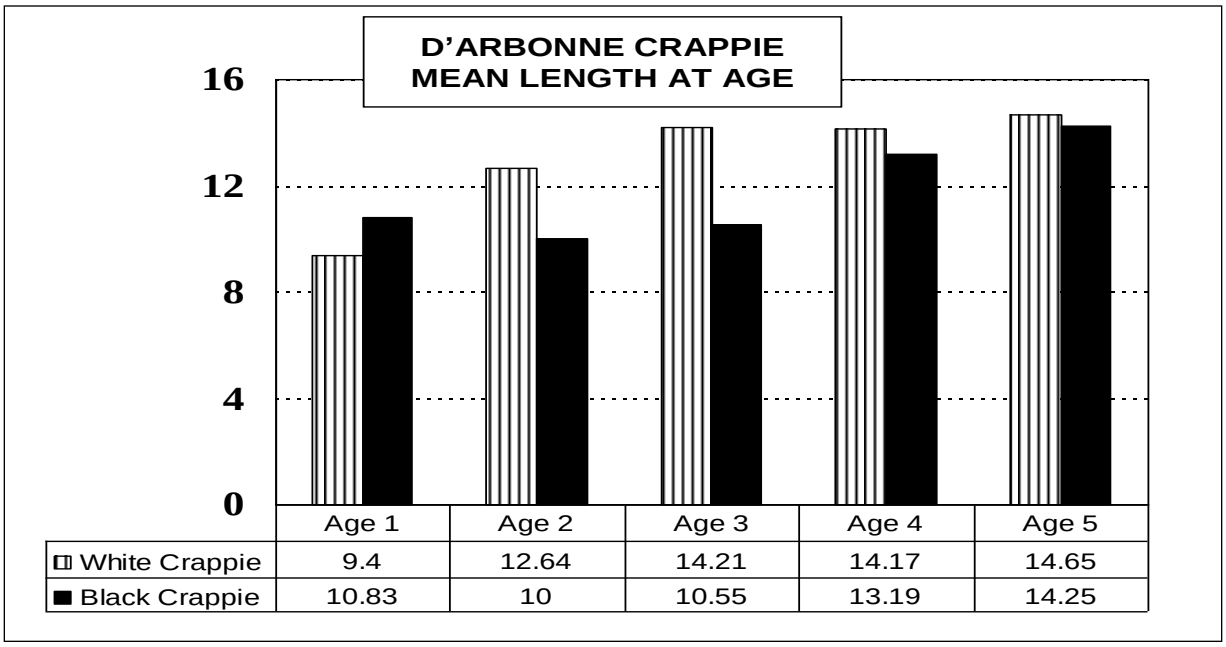


Figure 10. Mean length at age of D'Arbonne Lake white and black crappie captured in frame and lead nets from Nov. 2002 – Jan. 2003.

Lead nets became the standardized sampling gear for crappie in D'Arbonne Lake during 2006. Modifications to the sampling method were made in 2009 and have remained in effect since. Currently (2) 1.0 inch square mesh lead nets are fished together at each sample station for a period of approximately 48 hours. The lead nets have also been used to collect crappie for the stock assessment study initiated in 2010 (see summary in APPENDIX B). Figure 11 shows catch per hour rates for crappie samples from 2009 – 2012. Figures 12 and 13 show the catch rates for each inch group from the 2011 and 2012 samples, respectively. A normal population distribution is represented, with mid-size fish being the most abundant and all other size classes represented.

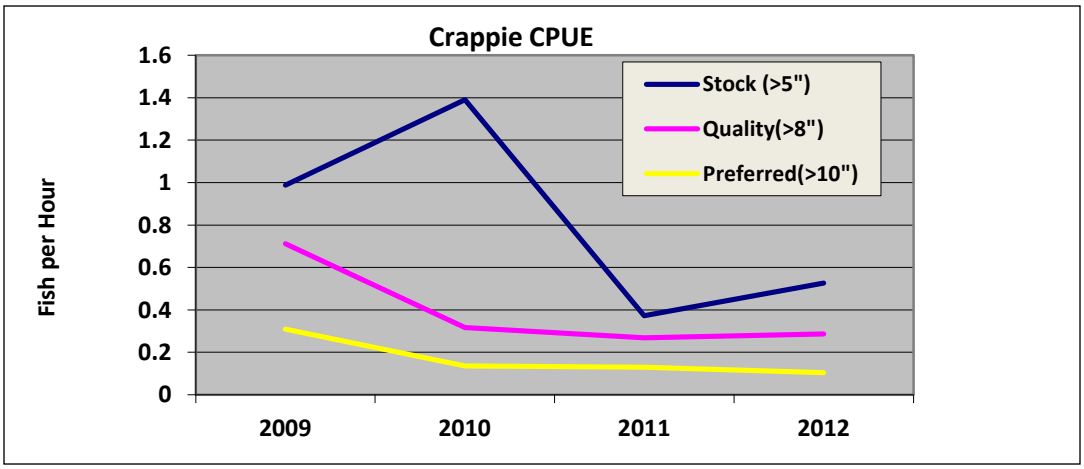


Figure 11. The catch per unit of effort (fish per hour) for three size classes of crappie from D'Arbonne Lake, LA collected in lead net samples from 2009 – 2012.

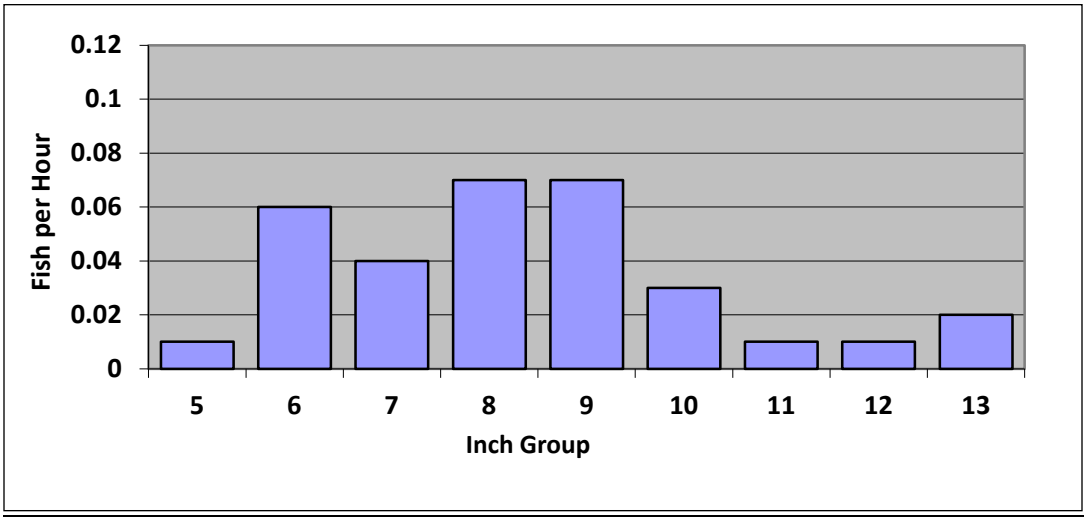


Figure 12. Size distribution in catch per hour of crappie from D'Arbonne Lake, LA collected in lead net samples in fall 2011 (n=186).

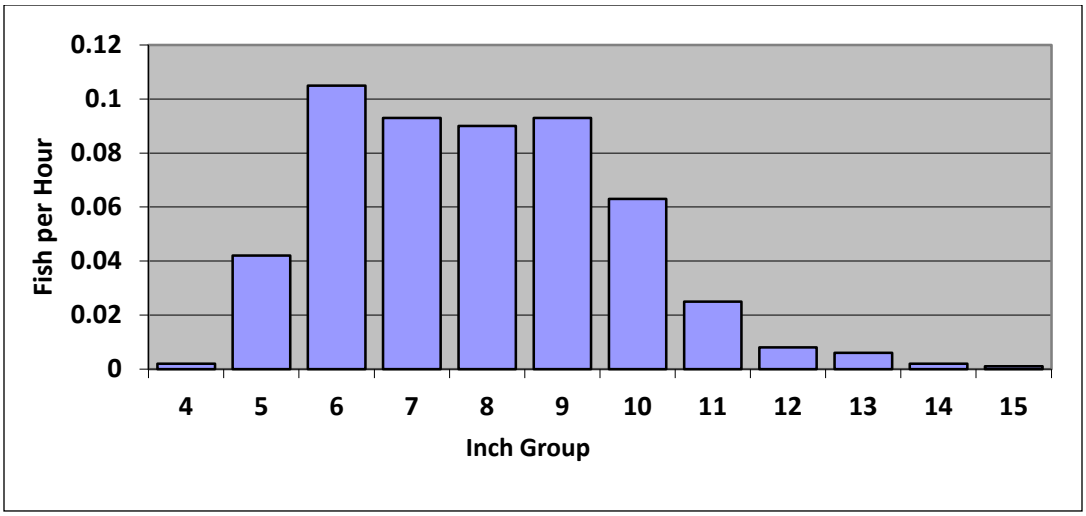


Figure 13. Size distribution in catch per hour of crappie collected from D'Arbonne Lake, LA in lead net samples in fall 2012 (n=633).

Crappie Stock Assessment Study

A stock assessment of crappie was conducted on D'Arbonne Lake from 2010 – 2012. A summary of the report prepared by West and Beck (2014) is found in **Appendix B**. The stated objectives and data collected were similar to the largemouth bass stock assessment. The age structure of the crappie population determined from this study is shown in Figure 14. These data were obtained from analyzing the otoliths of the crappie sampled during the stock assessment study and from a sample in 2009. The population is dominated by one and two year old crappie. These data, along with estimates of mortality rates, were analyzed to determine if alternative regulations would have any significant impact on the population. It was determined that none of the alternatives would achieve any desired effects.

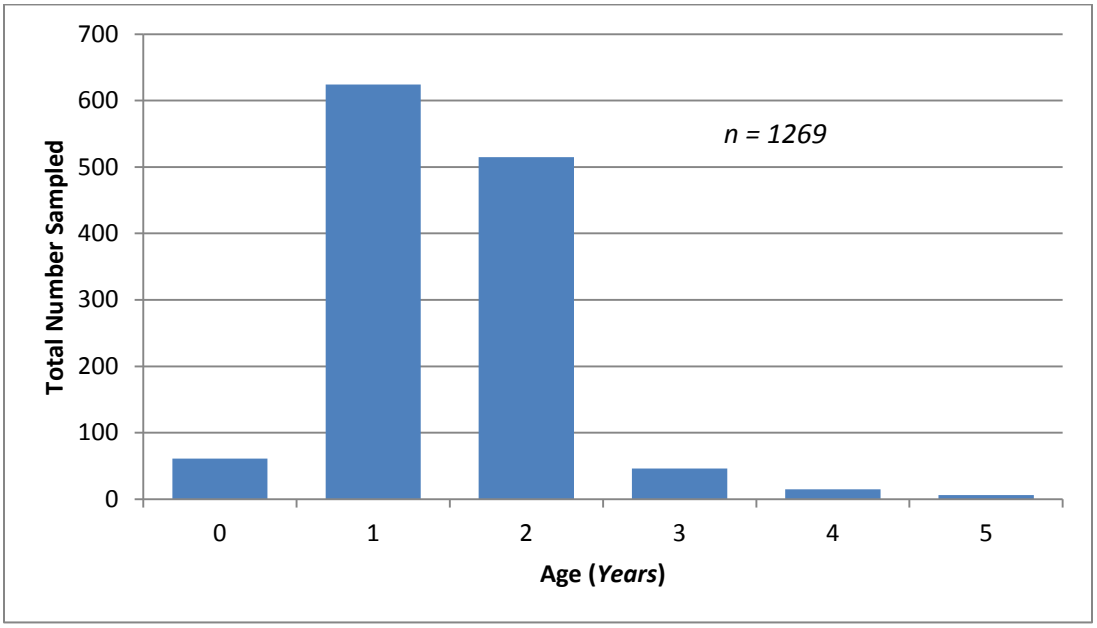


Fig. 14 Age structure of D'Arbonne Lake crappie from 2009 – 2012.

The crappie stock assessment study revealed that growth rates of D'Arbonne Lake crappie are rapid through age 2, and then slow to 2 inches or less per year. Table 3 shows the length of time in years for crappie to reach 8, 10, and 12 inches. These rates are considered average for Louisiana waterbodies.

Table 3. The average age for D'Arbonne Lake crappie to reach 8, 10, and 12 inches.

AGE (years)	LENGTH (inches)
1.84	8.0
2.62	10.0
3.73	12.0

Crappie Regulations History

In 2008, concerned anglers approached the Bayou D'Arbonne Lake Watershed District seeking an experimental 10 inch minimum size limit for crappie in an effort to increase their abundance and average size. In April 2008, LDWF presented information based on yield per recruit models from actual sampling data that concluded there would be no significant benefit to the population from the proposed changes. The following are excerpts included in an informational handout created by District 2 personnel:

Statistical analysis and modeling was performed on D'Arbonne Lake crappie data to predict the results of a 10 inch length restriction. Assumptions were made using a range of reasonable estimates of natural mortality and release mortality. No significant increase in total yield or average crappie size is predicted. The proportion of age 2 and older fish (over 12") in the population is predicted to increase by 3%. Angler catch would be constant, but legal harvest is predicted to decrease an average of 45%.

The following conclusion was given by LDWF in the handout: *Implementation of a 10 inch minimum length restriction on D'Arbonne Lake crappie may increase the survival of age 2 fish slightly. Unfortunately, those benefits will not result in an increase in older and larger crappie. A reduction in the daily creel limit from 50 to 25 crappie per person has the potential to distribute the total harvest more evenly in periods of high angler success, but not to the extent that could provide benefit to the crappie population. No significant effect in abundance or average size of D'Arbonne Lake crappie is predicted from either proposal or the combination thereof.*

In 2009, LDWF agreed to conduct a survey of D'Arbonne Lake crappie anglers to gather opinions of crappie management (**Appendix C**). Surveys were randomly conducted by boat to gather the following information from anglers: whether they lived on lake or not, how far they drove to fish at D'Arbonne Lake, average number of crappie trips per year, and whether they were satisfied with the current regulations for crappie (if not, what they would recommend). Appendix A summarizes the results of this survey. Overall, 65% of crappie anglers were satisfied with current regulations.

In 2012, anglers requested the LDWF Commission to reduce the daily creel limit for crappie to 25. LDWF biologists advised the Commission that the proposed regulation would have no negative consequence, but would also have no beneficial impacts to the population. This position was based on the fact the 2011 recreational angler creel survey of revealed that less than 3% of anglers harvested 25 or more crappie in a day. The Commission issued a Notice of Intent at its April meeting, which required a 100 day public comment period.

In November 2012, a daily creel limit of 25 crappie was implemented for D'Arbonne Lake. The boundaries of this regulation were from the D'Arbonne Lake Spillway to the Hog Pen and Gill's Ferry boat launches.

The daily creel limit for D'Arbonne Lake crappie was returned to 50 through Act 334 of the 2013 Louisiana Legislative Session. Act 334 also statutorily removed authority for D'Arbonne Lake crappie from the Louisiana Wildlife and Fisheries Commission. Act 389 of the 2014 Louisiana Legislative Session restored that authority with the following provisions:
The department first conducts sampling, and collects and analyzes the data on the fisheries resource in Lake D'Arbonne and the sampling, data, and analysis demonstrate that the fisheries resource is being negatively impacted, and the department recommends that the provisions of Paragraph (A)(5) of this Section (325) *be amended by rule.*

Results of the 3-year crappie stock assessment completed in 2012, (**APPENDIX C**) supported the 2012 LDWF staff position that implementation of proposed regulations would result in no significant change in the D'Arbonne Lake crappie population.

Other Sunfish

Relative abundance of bluegill *Lepomis macrochirus* and redear sunfish *L. microlophus* is also measured with the use of lead nets. Both species are abundant in D'Arbonne Lake and comprise an important component of the fishery. Bluegill were captured at a rate of 0.25 fish per hour, whereas redear sunfish were caught at a rate of 0.03 fish per hour during 2011 lead net sampling. Catch per hour rates of various size bluegill and redear from 2011 sampling are shown in Figure 15. It should be noted that 1.0 inch square mesh lead nets may not accurately reflect the total size distribution of the population, with possible bias against smaller size fish. A sample in 2012 (Figure 16) likely indicated an increase in 4 and 5 inch bluegill, though the catch rate of 6 and 7 inch bluegill was similar to 2011. The mean catch rate for bluegill was 0.538 fish per hour, while the mean catch rate for redear was 0.055 fish per hour. The ratio of bluegill to redear remained similar.

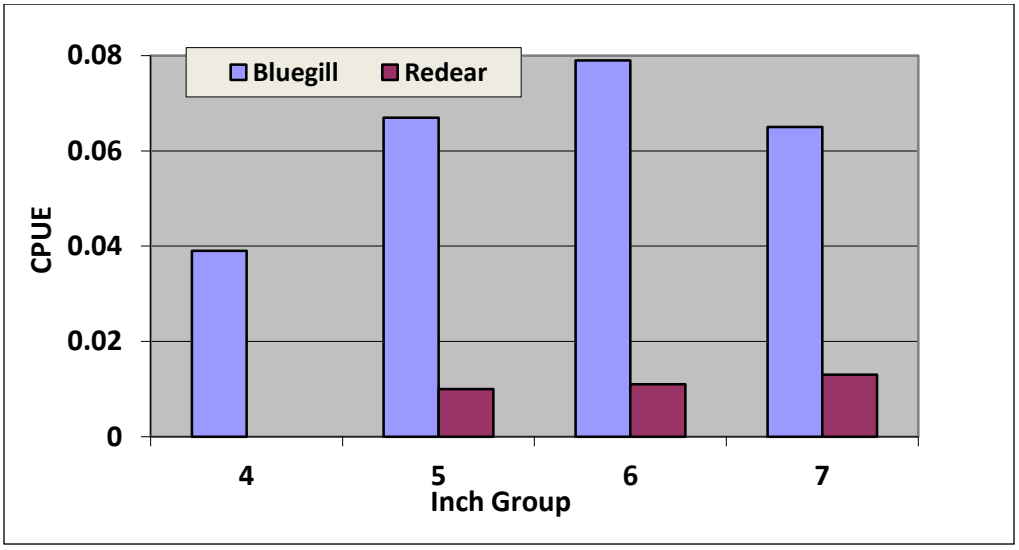


Figure 15. The catch per unit of effort for bluegill (n=129) and redear sunfish (n=4) collected during lead net sampling on D'Arbonne Lake, LA in fall 2011.

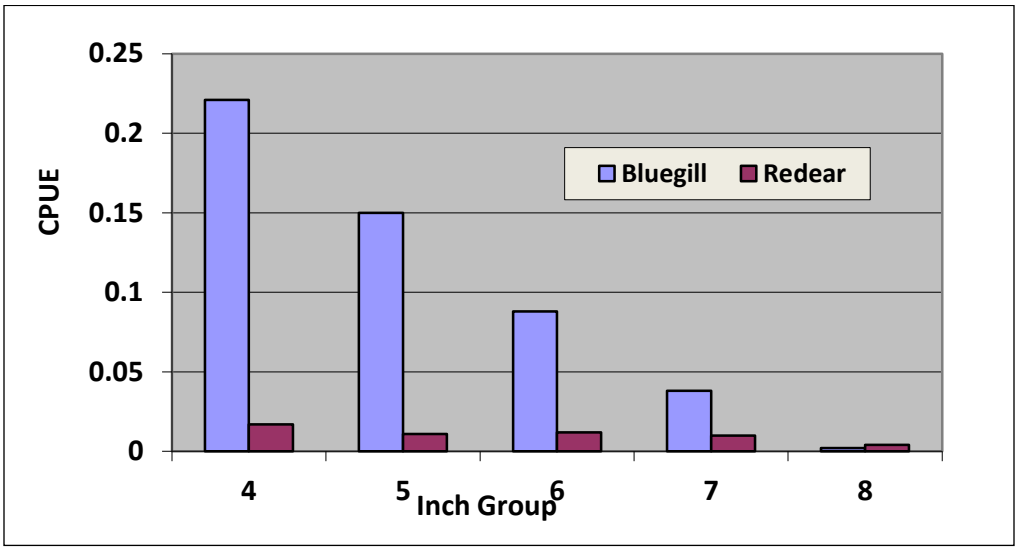
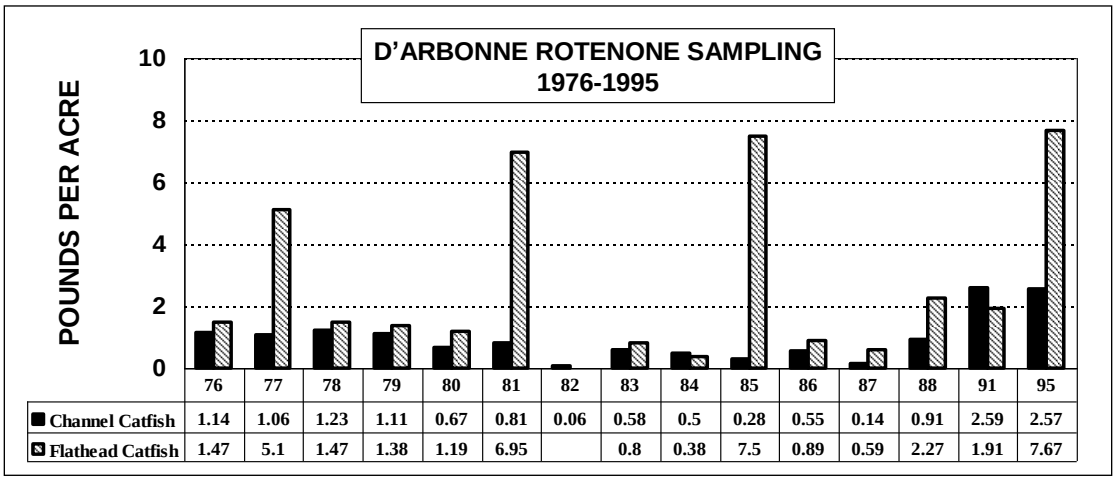


Figure 16. The catch per unit of effort for bluegill (n=439) and redear sunfish (n=45) collected during lead net sampling on D'Arbonne Lake, LA in fall 2012.

Commercial

Commercial fish species are generally not abundant in D'Arbonne Lake. However, the impoundment supports abundant populations of both channel catfish *Ictalurus punctatus* and flathead catfish *Pylodictis olivaris.* Catfish are harvested commercially in D'Arbonne Lake. Sport and commercial user group conflicts resulted in the removal of all forms of webbing in 1984. Hoop nets, slat traps, trotlines, limb lines and stump hooks remain legal. No nets, including hoop nets are allowed during drawdowns. From impoundment through 1995, biomass sampling with rotenone was used to determine status of standing fish crop, including catfish (Figure 17).



	76	77	78	79	80	81	82	83	84	85	86	87	88	91	95
Channel Catfish	1.14	1.06	1.23	1.11	0.67	0.81	0.06	0.58	0.5	0.28	0.55	0.14	0.91	2.59	2.57
Flathead Catfish	1.47	5.1	1.47	1.38	1.19	6.95		0.8	0.38	7.5	0.89	0.59	2.27	1.91	7.67

Figure 17. Pounds per acre of channel and flathead catfish collected during rotenone sampling conducted in D'Arbonne Lake from 1976 – 1995.

Biomass sampling with rotenone was discontinued in 1995 and standardized gill webbing is now used to collect population data on large fish species. Actual catch data presented below indicates length frequency for flathead catfish in the years 1993, 1996, 2000, and 2006 (Fig. 18). The samples are comparable except that eight sites were sampled in 1993 and 2000, and 9 sites were sampled in 1996 and 2006. Though sample size is small for all years, no recruitment problems are indicated and the current population is well represented by all size groups. More recent gill net samples reveal very similar catches to those shown below. Flathead and channel catfish are also routinely captured in lead nets. Figure 19 shows the length distribution of both species captured during lead net sampling in 2012.

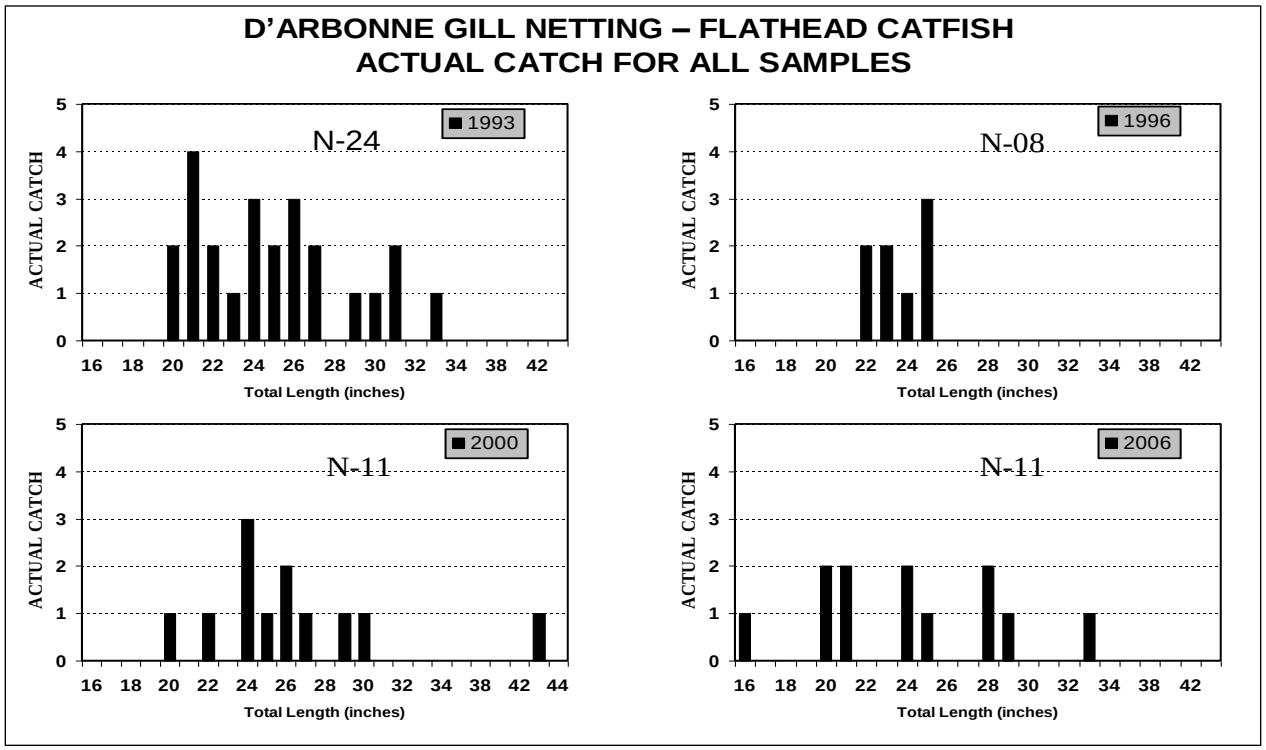


Figure 18. Size distribution of flathead catfish captured during gill net sampling on D'Arbonne Lake, LA in 1993, 1996, 2000, and 2006.

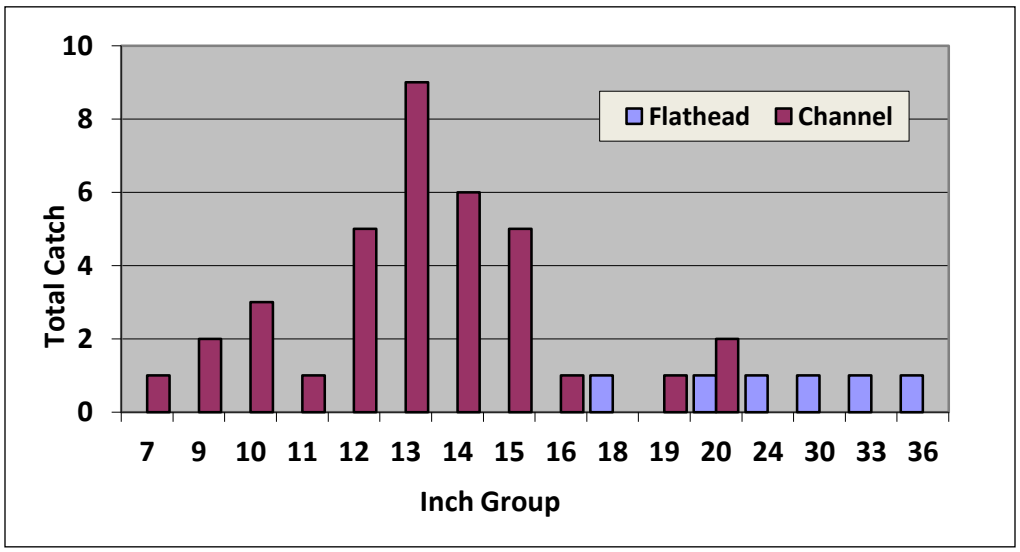


Figure 19. Size distribution of channel and flathead catfish collected during lead net sampling on D'Arbonne Lake in fall 2012.

Flathead Catfish Hogging

The term varies by region, but the practice involves the capture of catfish in spawning cavities (natural or man made). Some anglers feel into cavities that may be in shoreline banks or under washed out boat ramps. Others construct and place structures as indicated in the photo and description below (Fig. 20).

Flathead Catfish Hogging – The term varies by region, but the practice involves the capture of catfish in spawning cavities (natural or man made). Some anglers feel into cavities that may be in shoreline banks or under washed out boat ramps. Others place structures as indicated in the background photo. The sport has grown significantly in the past 5 years in this area and has spread to other lakes with flathead catfish populations such as Bistineau and even Caney. The sport is "visible" because of the different gear that is used and especially at boat ramps when a good catch is made. In addition, catfish hogging has been the focus of several television and print media stories, attracting both converts and concern.

Recently, the question has been raised that recreational harvest of catfish during the spawn may be increasing to the point of causing damage to the fishery. The D'Arbonne Lake Watershed District has formed a committee to look into it. The following concerns have been cited:

1.People were putting out and running hundreds of large spawning receptacles

2.Conflicts were occurring when catfish anglers were operating along the shoreline of private property (under private boat ramps and in other cavities)

3.The catfish population was down according to the reports of catfish anglers using other gear.

D'Arbonne Lake during 5 foot drawdown. ,

Boxes as in the above photo, old bath tubs, and hot water heaters are placed in water from 4-8 feet deep. Anglers using SCUBA equipment position themselves in a way to block the escape of the catfish. Catfish are caught by hand or sometimes with the use of a gaff or hook.

Figure 20. Description and photo of catfish hogging device in D'Arbonne Lake.

Receptacles of various types (boxes, old bath tubs, hot water heaters) are placed in water from 4-8 feet deep. Anglers using SCUBA equipment position themselves in a way to block the escape of the catfish. Catfish are caught by hand or sometimes with the use of a gaff or hook.
Catfish hogging has become popular in D'Arbonne Lake with some anglers reported to have placed dozens of receptacles out. The sport has grown significantly in the past 5 years in this northeast Louisiana and has spread to other lakes with catfish populations. Catfish hogging has been the focus of several television and print media stories. Recently, the question has been raised that recreational harvest of catfish during the spawn may be increasing to the extent of causing damage to the fishery. The D'Arbonne Lake Watershed District has formed a committee to look into it. The following concerns have been cited:

1. People were putting out and running hundreds of large spawning receptacles
2. Conflicts were occurring when catfish anglers were operating along the shoreline of private property (under private boat ramps and in other cavities)
3. The catfish population was down according to the reports of catfish anglers using other gear.

An opinion was requested of LDWF District II fisheries personnel. The following was presented to the Bayou D'Arbonne Watershed District at their February, 2006 meeting:

1. Catfish hogging is one of several legal means of harvest for flathead catfish in D'Arbonne Lake (others include hook & line, and hoop nets – both recreational and commercial).
2. As are the other legal means, catfish hogging is currently regulated under LDWF regulations. Those regulations include a separate license requirement and a limit of 5

structures (pipes) per person.

3. No decline in flathead catfish is indicated by LDWF Standardized sampling data for D'Arbonne Lake. No additional restriction for catfish hogging or any of the other legal methods of take is appropriate from a biological standpoint.

HABITAT EVALUATION

Aquatic Vegetation

Because of large areas of shallow water in D'Arbonne Lake, especially north of the Hwy. 33 Bridge, aquatic vegetation has maintained significant coverage since impoundment. As a result, complaints of vegetation levels considered to be overabundant have been expressed during that period of time, though only a small percentage of lakeside residences are impacted. Lake drawdowns for the purpose of weed control have been conducted as indicated below (Table 4). Subsequent drawdowns have been conducted since 1994, though they have primarily been scheduled for maintenance of shoreline properties. D'Arbonne Lake is currently on a four year drawdown schedule, with water levels lowered to five feet below pool stage after Labor Day and until at least November 15th. The scheduled drawdowns also serve as a means of vegetation control. A scheduled drawdown in 2008 was extended until mid-January for the additional purpose of hydrilla *Hydrilla verticillata* control.

Table 4. List of drawdowns conducted on D'Arbonne Lake for aquatic vegetation control.

D'ARBONNE LAKE WEED CONTROL DRAWDOWNS			
DATE	LOWEST LEVEL	GATES OPENED	POOL STAGE
1965	5.2'	09/11/65	02/09/66
1966	4.9'	09/13/66	02/22/67
1968	5.3'	09/10/68	12/13/68
1969	5.1'	07/31/69	01/09/70
1970	8.8'	09/09/70	03/12/71
1971	7.9'	09/05/72	12/16/72
1972	7.9'	09/05/72	12/16/72
1984	8.4'	09/10/84	10/26/84
1985	12.7'	09/05/85	02/10/86

Results of D'Arbonne Lake drawdowns conducted for weed control have been inconsistent, partially due to the influence of additional factors. Examples include rainfall during the scheduled drawdown period and exposure time of dewatered areas to cold weather. Often ignored is the considerable influence of post-drawdown water levels. The extent and duration of springtime water levels is a key factor for subsequent aquatic vegetation coverage. High water levels are common in D'Arbonne Lake due to its large watershed (67:1). The scheduled drawdown in the fall of 2012 appears to have been successful for providing at least temporary reduction in hydrilla coverage. Growth had still not reached pre-drawdown levels as of the fall of 2014.

A correlation has been documented between the level of drawdowns below pool stage and resulting effects to D'Arbonne Lake fish populations. Largemouth bass and sunfish displayed consistent declines following drawdowns greater than 5' below pool stage. Increased angler harvest is suspected for the decline in adult size largemouth bass. The combined effects of increased angler harvest and predation are suspected for declines in young bass and all sizes of sunfish.

Herbicide Treatment

Herbicide treatment of aquatic vegetation in D'Arbonne Lake has been conducted on an "as needed" basis. Alligator weed *Alternanthera philoxeroides* and water primrose *Ludwigia spp.* have been treated in areas with impacted shoreline residents. Control has been provided by LDWF spray crews using the liquid herbicides glyphosate (0.75 gal/acre) and 2,4-D (0.5 gal/acre). Common salvinia was discovered in the lake in 2009 and treated with diquat dibromide at a rate of 1 gal/acre. A total of eight acres were treated in 2009. This infestation was limited to close proximity of the Hwy. 2 boat ramp, and although it was observed in small amounts in 2010, never posed any significant threats and is currently no longer observed in the lake. In 2005, a large field of American lotus *Nelumbo lutea* in the D'Arbonne Bayou arm of the lake had expanded to the point where it was impacting several residences and also a nearby boat lane. It was initially treated in 2005 with granular 2,4-D at a rate of 100 lbs/acre. Herbicide applications have been made in subsequent years with granular 2,4-D and also glyphosate (0.75 gal/acre) in an effort to prevent this field from expanding further. Hydrilla was first observed in the lake in 2005 and was immediately treated with Cutrine Plus (chelated copper) at a rate of 1 gal/acre for a total area of six acres. Herbicide control has been provided with diquat (1 gal/acre) primarily around impacted public boat launches and the State Park fishing piers. No herbicide applications for hydrilla control have been necessary in recent years.

Recent herbicide applications have been made primarily for the control of emergent species in shallow coves where shoreline property owners were impacted. Primrose and alligator weed are the most problematic species in these areas. Glyphosate and Imazapyr are commonly used. American lotus has been treated with 2,4-D to reduce coverage near developed shorelines. When necessary, hydrilla is treated with subsurface applications of diquat dibromide, sometimes mixed with a copper chelate (Cutrine Plus), in the vicinity of public boat ramps and where it is impeding navigation. A small amount of water hyacinth *Eichhornia crassipes* also requires regular treatments on D'Arbonne Lake, with 2,4-D also being used (no LDAF waiver is required in Union Parish). A summary of acres sprayed from 2005 – 2014 for the most common nuisance species is given in D'Arbonne Lake MP-A. Table 5 below shows total acres sprayed on D'Arbonne Lake in 2014.

Table 5. Total acres of nuisance aquatic vegetation treated with herbicide on D'Arbonne Lake in 2014.

Species	Alligator weed	Hydrilla	Water hyacinth	Primrose	American Lotus
Acres	15	~~13~~	~~16~~	~~12~~	105

Current Status and Coverage

Throughout 2014, aquatic vegetation coverage remained stable. Overall, coverage was similar to that documented during the vegetation type map conducted in the summer of 2013 (APPENDIX D). American lotus in the D'Arbonne arm remains significant, though does not appear to have

expanded since 2013. Hydrilla has been the species of most concern on D'Arbonne Lake since it was first documented here in 2005. Coverage has not reached nuisance levels since the drawdown of 2012. It is currently found scattered in the Bayou D'Arbonne and Corney Creek arms of the lake. Vegetation south of the Hwy. 33 Bridge is limited mostly to emergent species in shallow coves. The shallow "flats" areas in the creek arms continue to be infested with vegetation, both submerged and emergent.

Coverage and Status of Problem Plant Species as of 12/31/14

-American Lotus – several large "fields" of lotus are found throughout the D'Arbonne arm of the lake, including some areas near shoreline residences, which require herbicide control
-Alligator weed and water primrose – common throughout the lake, mostly confined to shallow coves, undeveloped shorelines, and the shallow flats on the northern end of the lake.
-Hydrilla – coverage reduced since 2012, scattered in shallows mostly in the D'Arbonne arm
-Water hyacinth – minimal coverage
-Chara – common in the shallows, abundant in some areas

Coverage and Status of Beneficial Plant Species as of 12/31/14

-Coontail *Ceratophyllum demersum* – common but not abundant throughout the lake in depths to 3 ft.
-American pondweed *Potamogeton nodosus* – small patches throughout lake, most abundant in the D'Arbonne arm.

Vegetation Type Maps

The most recent type map survey was conducted in 2013 and is included in **Appendix D**. Previous type maps are included in D'Arbonne Lake MP-C (archives).

Artificial Structure

Complex cover can be defined as any type of underwater structure that affords protection to small fish. Rather than objects such as a single log or stick, complex cover is normally referred to as "thick cover." Many of our Louisiana impoundments have lost their available complex cover. To that end, LDWF is now in the process of developing guidelines to address construction and deployment of artificial reefs. Our primary concern is that materials or methods used under the new guidelines initiate no environmental consequences. Consideration of all reef types has been secondary to this basic premise. Other considerations are:

1. Materials used must be readily available and inexpensive.
2. They should have negative buoyancy so that the reef stays in place.
3. They should be made of non-toxic materials that do not deteriorate in a short period of time.
4. They should provide maximum structural complexity and attachment surfaces for algae.
5. They must be of a unit size that can be handled without the aid of mechanical lifting devices.
6. They must not require a large time investment for construction or deployment.

Polyethylene feed pallets have recently become available as a construction material. The pallets were offered, free of charge, to LDWF by Cargill, Nutrena Feeds of Lecompte, Louisiana. Used to stack feed sacks, the pallets that become bent or broken over the course of time are unsuitable

for their automated system. As a result, the company must dispose of several hundred pallets per month.

As illustrated below (Figure 21), the various openings in the top surface of the pallet qualify as complex in nature. Dimensions are small as compared to traditional wooden pallets. The large round hold in the center of all of the pallets is a key feature for construction of reefs with the pallets.

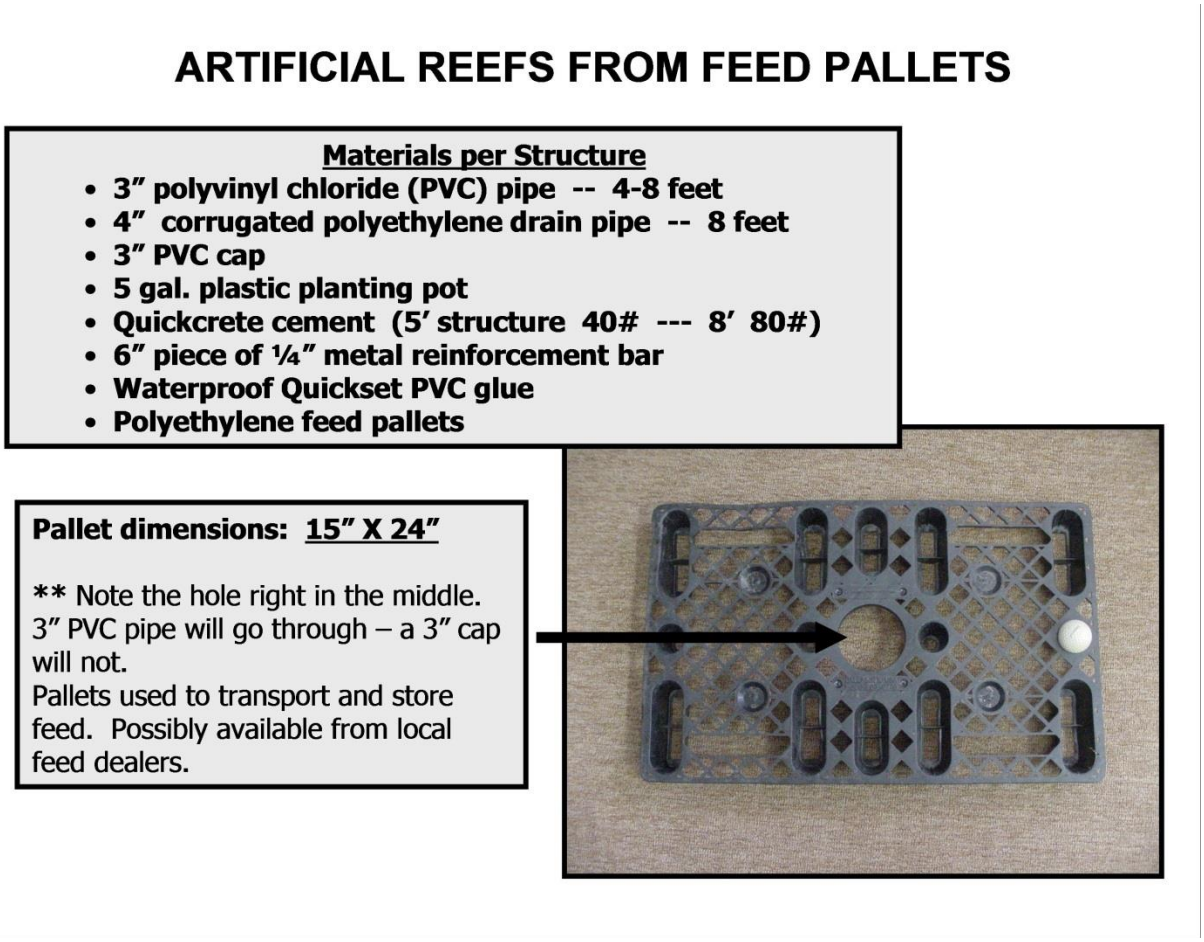


Figure 21. Photo of feed pallet and list of materials used in constructing artificial reefs that have been placed into D'Arbonne Lake by LDWF.

Lengths of 3 inch PVC are set in a bucket of concrete with pallets being placed over the PVC at desired intervals. Spacers (cut 3" PVC) are used to separate the pallets. A PVC cap is glued to the top. A completed structure is shown in Figure 22, below. Air trapped in the 3" pipe provides enough buoyancy for the structure to self-right if necessary. In areas where adequate complex cover is not available, the structures are quite effective as fish attractors.

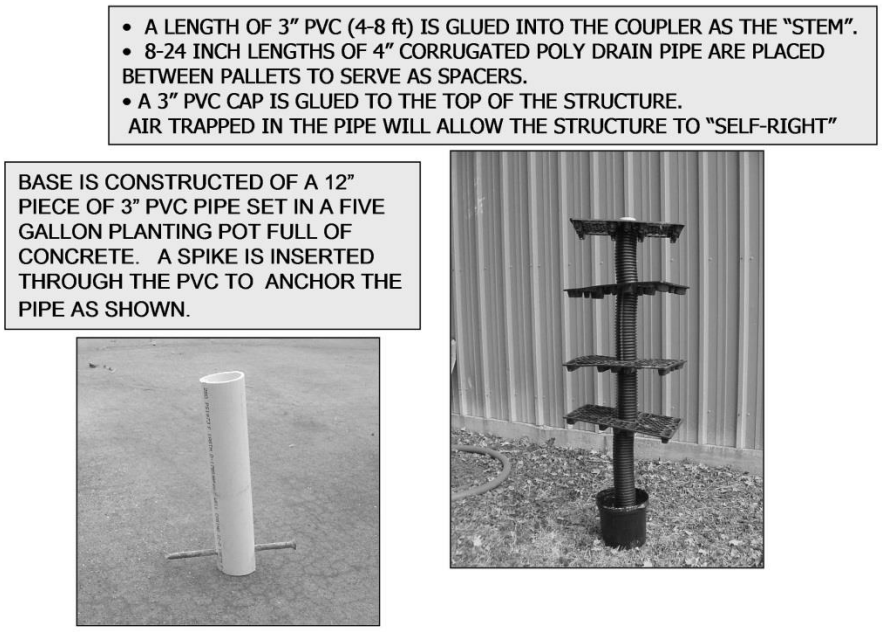


Figure 22. Photo of assembled structure used for attracting fish in D'Arbonne Lake.

Floating self-ballasted buoys (Figure 23) were used to mark reef locations. Floating buoys require routine maintenance to ensure that they remain attached to anchors. Large nylon rope (0.5" braided) was used as mooring lines. Corrosion from the acidic waters of D'Arbonne Lake limits effective longevity of metal mooring line (chain or wire rope) to about two years.

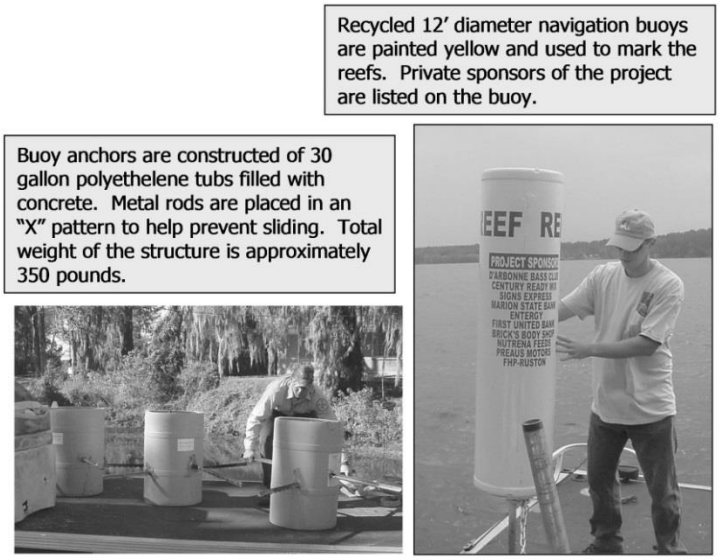


Figure 23. Photo of buoy used to mark artificial reef locations in D'Arbonne Lake, Louisiana.

Placement of the trees should be in a random manner, with the buoy being roughly in the middle. Reef locations should have enough variance in water depth to accommodate fish preferences throughout the year. Reef locations in areas without existing forms of cover are most likely to be effective as fish attractors. Locations with high frequency of non-resident or novice anglers should also be considered as potential sites. Reef size should be large enough to allow utilization by several parties at one time. At least 100 units per reef are recommended.

In coordination with the Bayou D'Arbonne Watershed District, six artificial reefs were constructed in 2004 at coordinates as listed below (Table 6).

Table 6. Coordinates of artificial reefs placed into D'Arbonne Lake by LDWF.

D'ARBONNE ARTIFICIAL REEF STRUCTURES		
NAME	COORDINATES	
State Park Reef	32^0 46'15.36" N	-92^0 28'41.18" W
Horseshoe Reef	32^0 47'25.34" N	-92^0 27'17.66" W
Four Mile Creek	32^0 46'37.64" N	-92^0 25'34.22" W
Stowe Creek	32^0 43'54.09" N	-92^0 24'12.08" W
Piney Point	32^0 44'33.09" N	-92^0 22'31.04" W
Reef 5	32^0 43'52.09" N	-92^0 21'32.04" W

Substrate

The substrate shallow areas that have been dewatered is a hard composition of sand and clay. Sand is predominant along many of the creek channels. Fragments of iron ore rock form a significant component of the substrate in the lake bottom. Deeper substrate not subject to current or dewatering has accumulated organic material and silt on the surface. Gravel beds have been constructed in the vicinity of D'Arbonne State Park fishing piers in 2002, 2003, 2005, and 2006. Approximately 40 cubic yards of pea gravel were used each year. Angler success has improved as a result, particularly for sunfish. The photo below (Figure 24) shows LDWF personnel spreading gravel into the water with a high volume water pump.

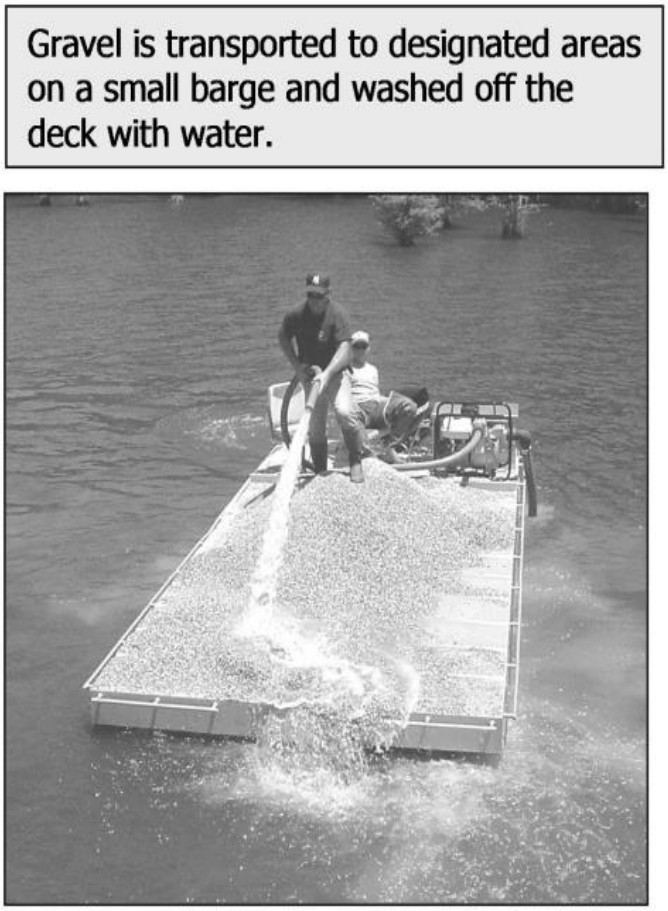


Figure 24. Gravel is displaced by a high volume water pump to enhance spawning substrate around fishing piers at D'Arbonne Lake State Park.

CONDITION IMBALANCE / PROBLEM

1. The large watershed of D'Arbonne Lake has flooded low lying properties and structures built below design storm elevation (90.0' MSL) since impoundment. It's important to note that the second highest water level (86.1'MSL) for D'Arbonne Creek at Farmerville was recorded in 1958, before construction of the D'Arbonne spillway. The flooding is not a problem from a biological perspective. However, efforts to mitigate high D'Arbonne Lake water levels through "flood control" spillway gate openings can be. The four 5'x5' spillway gates offer no significant increase in water that already flows over the 799' spillway. In fact, water flow through the gates is indirectly proportional to water flow over the spillway (as in times of high water). Less water can flow through the gates as more water overtops the spillway. The spillway structure was designed only for infrequent lake dewatering, not flood protection. Inappropriate spillway gate openings expose the structure to damage from logs and debris. The cast iron gates and the concrete structure can be damaged upon closure of the gates, resulting in partial to extensive dewatering of the lake. Recently, two 10 x 40 ft. tainter gates have been installed in the dam on the south side of the spillway. These gates are designed to alleviate flood conditions on the lake and will also be used for drawdowns. The implementation of these gates creates the potential of rapid dewatering and reduced high water levels as compared to those that have occurred in the past. There has been a correlation between high water levels during the spawning months and recruitment success. Figure 25 shows largemouth bass recruitment to be stimulated when water levels have reached or exceeded 83.0 ft. There is concern by fisheries managers that eliminating or significantly reducing annual water fluctuation patterns could negatively impact recruitment of nesting fish species.

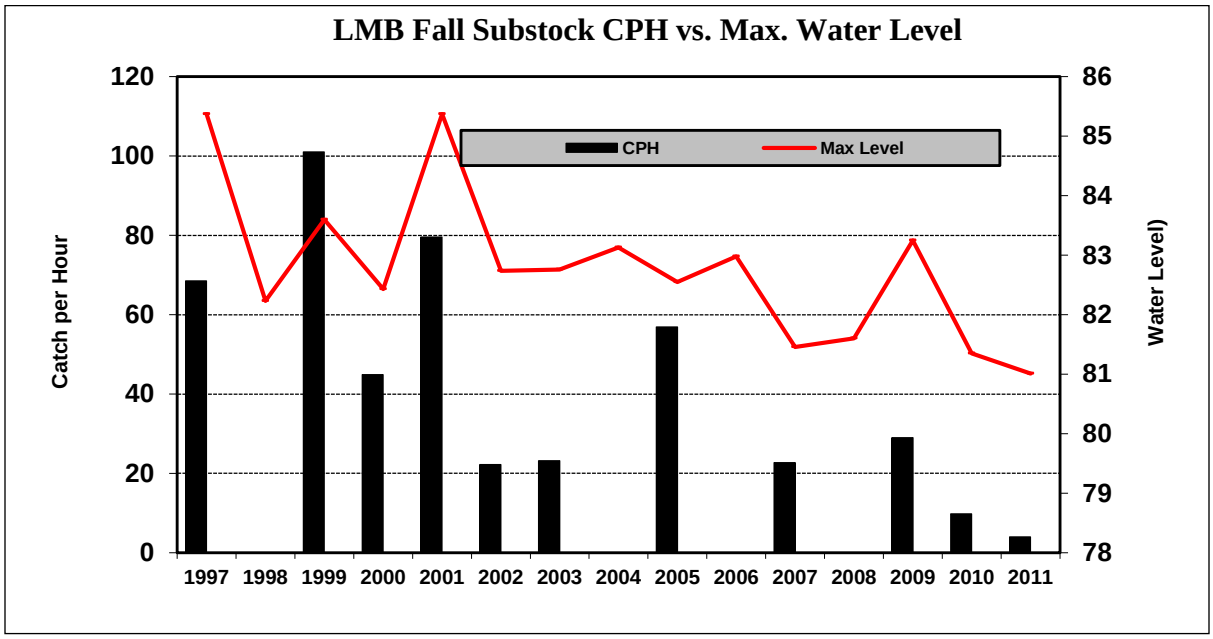


Figure 25. The CPUE (number per hour) of substock-size largemouth bass on D'Arbonne Lake from fall electrofishing and maximum water levels from March – May for the years 1997 – 2011.

2. The recent occurrence and predicted expansion of hydrilla threatens to seriously impair utilization of D'Arbonne Lake. Hydrilla coverage is expanding and currently impacting shoreline access. Scheduled drawdowns (every four years – 5 foot below pool stage) have provided limited control and have slowed expansion of the invasive plant species.

CORRECTIVE ACTION NEEDED

1. Unfortunately, flooding is inevitable for D'Arbonne shoreline properties below the elevation of 90.0' MSL. Inherent risks to structures built below 90.0' MSL are assumed by owners and should be understood by all users. The tainter gates are expected to remediate flooding to some extent. However, the potential for flooding and related damage to properties below 90.0' MSL remains significant.

2. Control measures for hydrilla in D'Arbonne Lake are effectively limited to water level fluctuation. Unfortunately, drawdowns can only provide temporary relief as a control measure. D'Arbonne Lake drawdowns have provided inconsistent benefits related to vegetation control. It is important to note that drawdowns more extensive than five feet have consistently produced negative impact to largemouth bass and sunfish populations.

RECOMMENDATIONS

1. Continue introductions of Florida bass. Stocking will include transport to areas throughout the impoundment that offer protection for the young fish. Genetics sampling is to be conducted as a follow-up to determine recruitment of the Florida genome into the D'Arbonne Lake largemouth bass population.

2. Continue existing recreational and commercial harvest regulations until such time as sampling results indicate that change is appropriate and necessary from a biological perspective or such time as a change in management goal is indicated by the collective opinion of D'Arbonne Lake anglers.

3. Continue scheduled standardized sampling of fish populations and aquatic vegetation to determine status over time.

4. Attend meetings of the Bayou D'Arbonne Lake Watershed District on at least an annual basis to discuss management, share ideas, and information.

5. Investigate and provide analysis of fisheries response to tainter gate operation. The current operation plan authorizes gate openings to limit the high water stage to 82.5 feet. Specifically, recruitment of largemouth bass and crappie will be monitored.

6. Investigate the use of water level fluctuations with new tainter gates for management of hydrilla and other nuisance plant species. A series of short term drawdowns of 2 – 4 ft. below pool during summer months may alleviate severe infestations along the shorelines in years when the scheduled drawdowns do not occur.

7. Hydrilla located in the vicinity of public boat launches will be treated with a subsurface application of a tank mixture of Cutrine®-Plus (chelated copper) and Tribune™ (diquat dibromide) at a ratio of 3:2, respectively. The mixture will be

applied at the rate of 5.5 gallons per surface acre of hydrilla. An alternative mixture will be to apply only diquat dibromide on the surface and by subsurface injection at a rate of 2.0 gal/acre. These areas should be inspected monthly for the presence of hydrilla. Coverage of American lotus should only be reduced where it is impacting shoreline residential areas or boat navigation. An application of liquid 2,4-D at 0.5 gal/acre will be made in these areas on an as needed basis. Glyphosate, 2,4-D or Imazapyr will be used for treatment of most other emergent vegetation with rates used in accordance with the LDWF Aquatic Herbicide Application Protocol.

APPENDIX A.

(return to bass assessment)

Summary of Largemouth Bass Stock Assessment Report*

Every fish population is the product of a unique set of influences, both natural and man-induced. A thorough understanding of those influences and the corresponding population response is essential to good fisheries management. As part of a statewide effort, the Louisiana Department of Wildlife and Fisheries (LDWF) recently completed a study to describe the D'Arbonne Lake largemouth bass (LMB) population. The project included data collection over a three year period from 2010 – 2012. Population dynamics including relative abundance, spawning success, growth, body condition, mortality, and longevity were measured. D'Arbonne anglers were also surveyed to determine their collective influence on the LMB population.

Electrofishing gear was used by fisheries biologist to collect LMB from D'Arbonne Lake each spring. Length and weight measurements were recorded for each fish and ear bones (called otoliths) were removed from approximately 58% of the sampled fish for age and growth analyses. Annual growth rings on the otoliths provide an accurate measurement of fish age. Size and age for all of the sample fish were combined to generate estimates of average rate and longevity. Angler surveys were conducted during the sample period to document fishing effort, angler catch rate and harvest rates.

Figure 2 illustrates that D'Arbonne Lake supports a healthy bass population with some LMB reaching 22 inches. Good representation of fish in the 10 to 16 inch range was observed for each year. It is important to note that spring sampling typically does not include fingerling size bass. However, the recurring presence of small (age-1) bass indicates consistently successful reproduction.

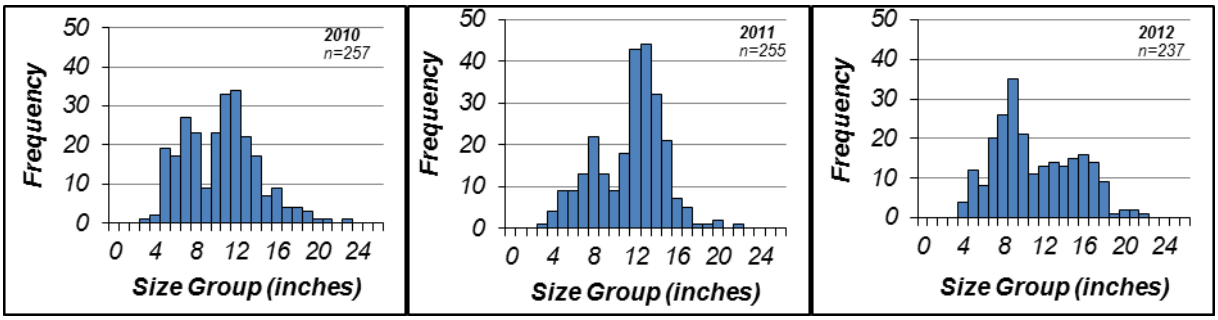


Figure 2. Annual length distributions of largemouth bass collected from D'Arbonne Lake during spring electrofishing surveys in 2010-2012. Sample sizes (n) are presented in each graphic.

Age structure of the complete electrofishing sample (2010-2012) is shown in Figure 3. The majority of the age 8+ fish were females. While bass up to 10 years old were found, only a small percentage of D'Arbonne Lake LMB 5 years of age and older were included in the sample. Average length at age for D'Arbonne Lake bass is provided in Table 8. Growth is rapid through age 4, but then slows to only an inch or less per year.

Body condition for D'Arbonne Lake bass can be described as robust. Good physical condition of bass generally is the product of an adequate food supply that is readily available to predation.

One of the more significant findings is the stable recruitment of age-1 LMB in the D'Arbonne Lake population. Contributing factors include favorable water fluctuation, quality spawning substrate, and adequate cover for fingerlings.

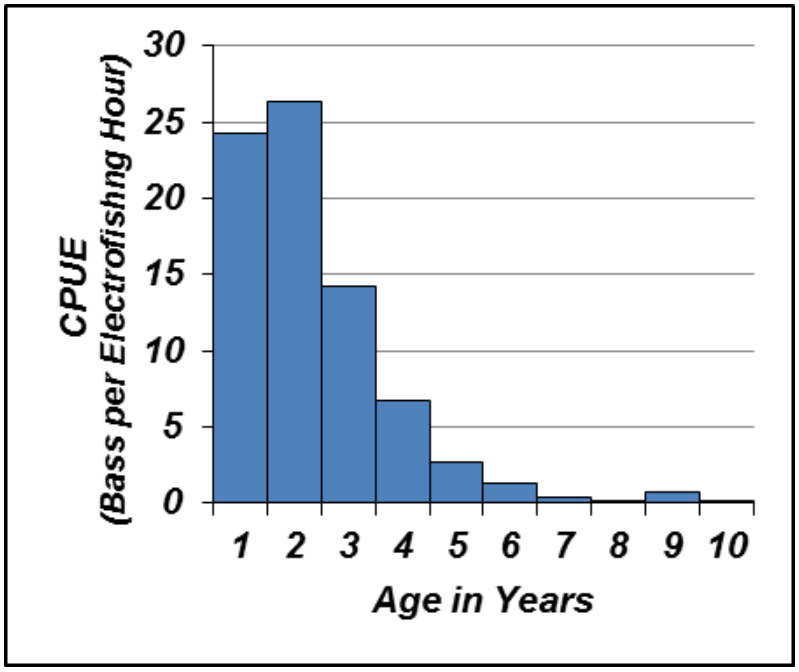


Figure 3. The age structure of largemouth bass collected from D'Arbonne Lake from 2010-2012.

Table 8. Length at age of D'Arbonne Lake largemouth bass.

Age	Length in Inches
1.0	7.7
2.0	11.5
3.0	14.1
4.0	16.1
5.0	17.4
6.0	18.4
7.0	19.1
8.0	19.7
9.0	20.0
10.0	20.3

The rate at which fish die each year is referred to as mortality. Mortality consists of two parts: natural mortality (predation, disease) and fishing mortality (angler harvest and discard mortality). Results of the study indicate that the total mortality rate for D'Arbonne Lake LMB is 57% per year. At that rate, if you start with 100 age-1 D'Arbonne bass, only 3 will remain by age 5.

The results of this study suggest that the D'Arbonne Lake LMB population has a total mortality that is equally influenced by natural and fishing mortalities (29 and 28%, respectively). . The fishing mortality rate for D'Arbonne Lake LMB is 28% per year. This rate comes from two

sources; 1) harvest and 2) post release mortality. Creel survey results suggest that D'Arbonne Lake anglers voluntarily release a much larger percentage of LMB than they harvest (82% are released).

SUMMARY: Length distribution, age structure, growth rate, and mortality rate were found to be at levels that provide a stable LMB population in D'Arbonne Lake. The population was equally influenced by natural and fishing mortalities. The dynamics of the D'Arbonne Lake LMB population and the current characteristics of D'Arbonne Lake anglers are such that size restrictive regulations would have a relatively insignificant effect on the population.

***West, Joe, S. Beck, and D. Davis. 2013. Bayou D'Arbonne Lake Largemouth Bass: Population and Fishery Characteristics with Size Regulation Simulations. Fisheries Research and Assessment Section. LDWF.**

APPENDIX B.

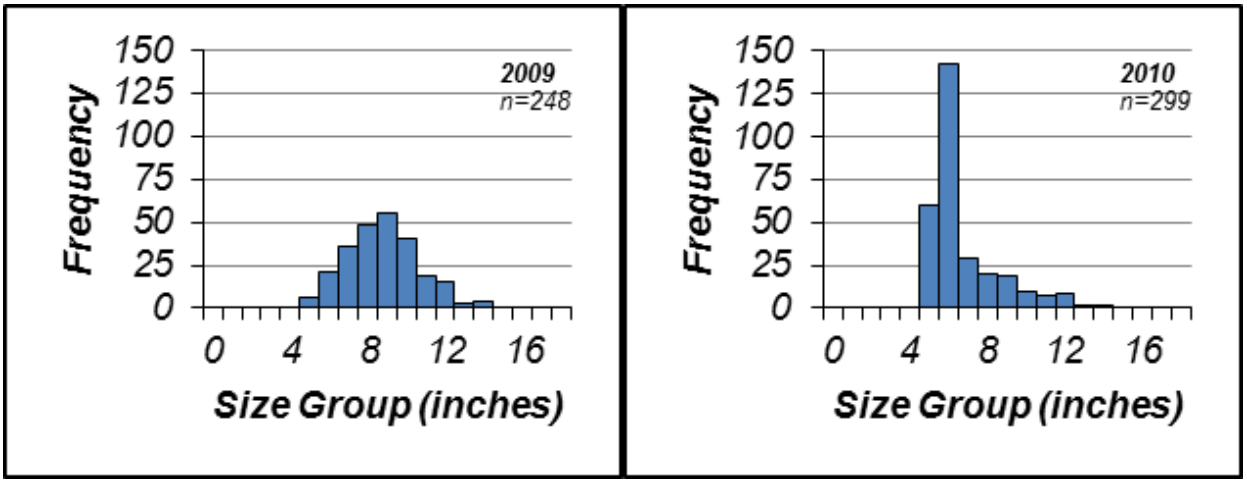
(return to crappie)

Summary of Crappie Stock Assessment Report*

As part of a statewide effort, the Louisiana Department of Wildlife and Fisheries (LDWF) recently completed a study to describe the D'Arbonne Lake black crappie and white crappie (crappie) populations. The project included data collection over a four year period from 2009 – 2012. Population dynamics including relative abundance, spawning success, growth, body condition, mortality, and longevity were measured. D'Arbonne Lake anglers were also surveyed to determine their collective influence on the crappie population.

Lead net fishing gear was used to collect crappie from D'Arbonne Lake each fall. Length and weight measurements were recorded for each fish and ear bones (called otoliths) were removed from approximately 37% of the sampled fish for age and growth analyses. Annual growth rings on the otoliths provide an accurate measurement of fish age. Since both species of crappie are managed under the same harvest regulations, size and age for all of the sample fish were combined to generate estimates of average growth rate and longevity. Angler surveys were conducted during 2011 to document fishing effort, angler catch rate and harvest rates.

Figure 4 illustrates that D'Arbonne Lake supports a healthy crappie population with some individual crappie reaching 15 inches. Five to 12 inch fish were observed in all four years of the project. It is important to note that fall lead net sampling typically does not include young-of-the-year size crappies. However, the recurring presence of small 5 to 10 inch (age-1) crappie indicates successful reproduction from the previous year.



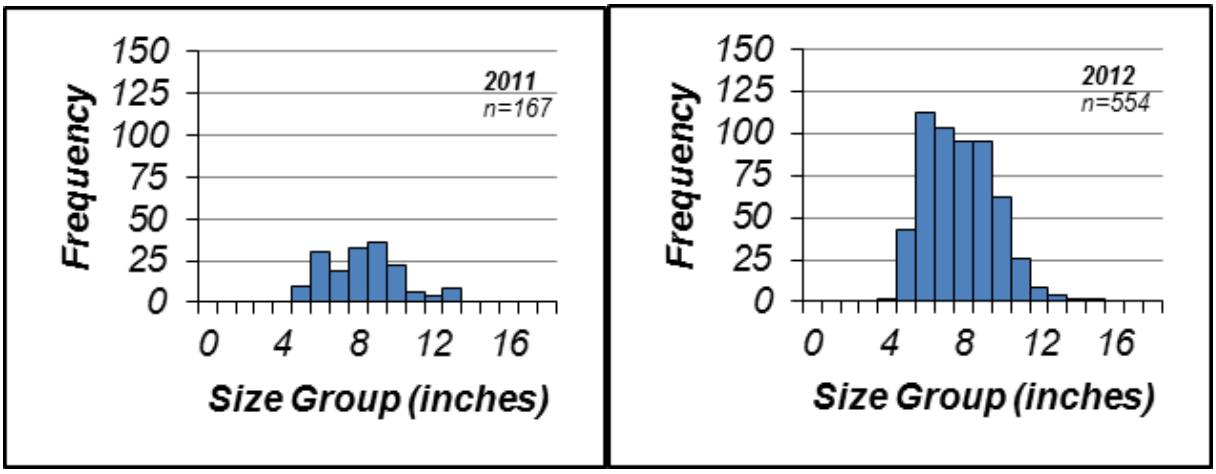


Figure 4. Length distributions of crappie collected from D'Arbonne Lake during fall leadnet surveys in 2009-2012. Sample sizes (*n*) are presented in each graphic.

Age structure of the complete lead net sample (2009-2012) is shown in Figure 5. Ninety percent of the total sample was comprised of age-1 and age-2 crappie. While crappie up to 5 years of age were found, only a small percentage of D'Arbonne Lake crappie were 3 years and older. Average age at length for D'Arbonne Lake crappie is provided in Table 9. Growth is generally rapid through age-2, but then slows to only two inches or less in length per year.

Body condition for D'Arbonne Lake crappie can be described as good. Good physical condition of crappie generally is the product of an adequate food supply that is readily available to predation.

One of the more significant findings is the stable recruitment of age-1 crappies in the D'Arbonne Lake population. Consistently favorable spawning conditions for crappie are attributed.

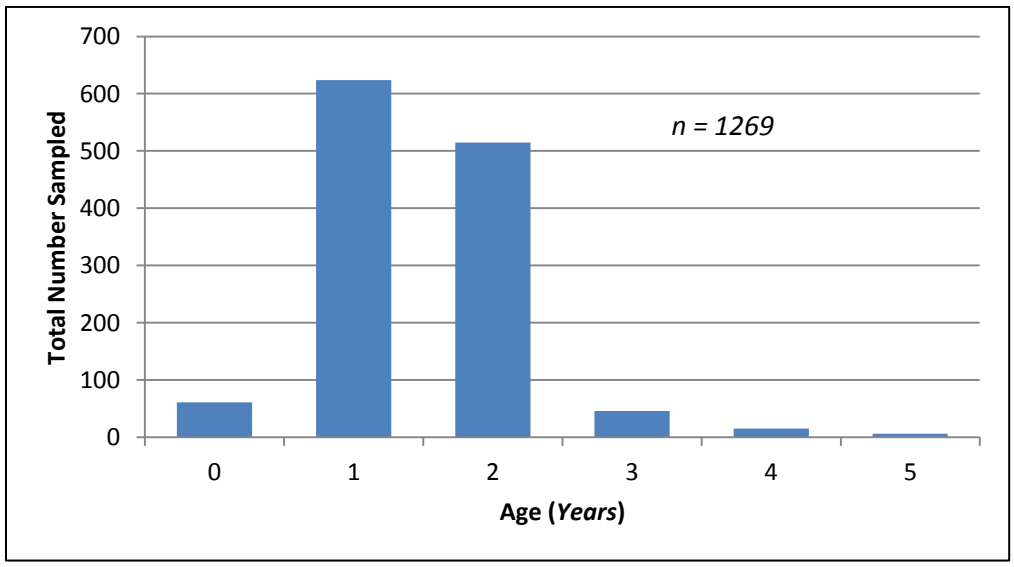


Figure 5. The age structure of D'Arbonne Lake crappies collected in 2009 - 2012.

Table 9. Average age at length for D'Arbonne Lake crappie.

Age in Years	Length in Inches
1.84	8.0
2.62	10.0
3.73	12.0

The rate at which fish die each year is referred to as mortality. Mortality consists of two parts: natural mortality (predation, disease) and fishing mortality (angler harvest and discard mortality). Results of the study indicate that the total mortality rate for D'Arbonne Lake crappie is moderately high (77%) when compared to other recently sampled Louisiana lakes. The following example is provided to illustrate the effect. At 77% mortality, if you start with 100 age-1 D'Arbonne Lake crappie, 23 will remain alive by age-2, 5 by age-3 and less than one fish will remain alive by age-4.

The results of this study suggest that the D'Arbonne Lake crappie population has a total mortality that is equally distributed between fishing mortality and natural factors (40% and 37%, respectively). The fishing mortality rate for D'Arbonne Lake crappie is 40% per year. This rate comes from two sources; 1) harvest and 2) post release mortality.

Louisiana crappie fisheries are described as harvest oriented. According to the 2000 Louisiana Crappie Fishing Survey, 74% of crappie anglers reported that they harvested crappie for food. The size distribution of angler harvested crappie from D'Arbonne Lake during 2011 is shown in Figure 3. While some small crappie were observed in the surveys, most were 7 inches and larger in length with 8 to 13 inch crappie dominating the catch. Survey results also indicated that 60% of crappie anglers harvested from 1 - 10 crappie per trip, while 33% of the anglers harvested no crappie at all (Figure 6). The average annual harvest rate for D'Arbonne Lake crappie was 2.1 fish per crappie angler per trip.

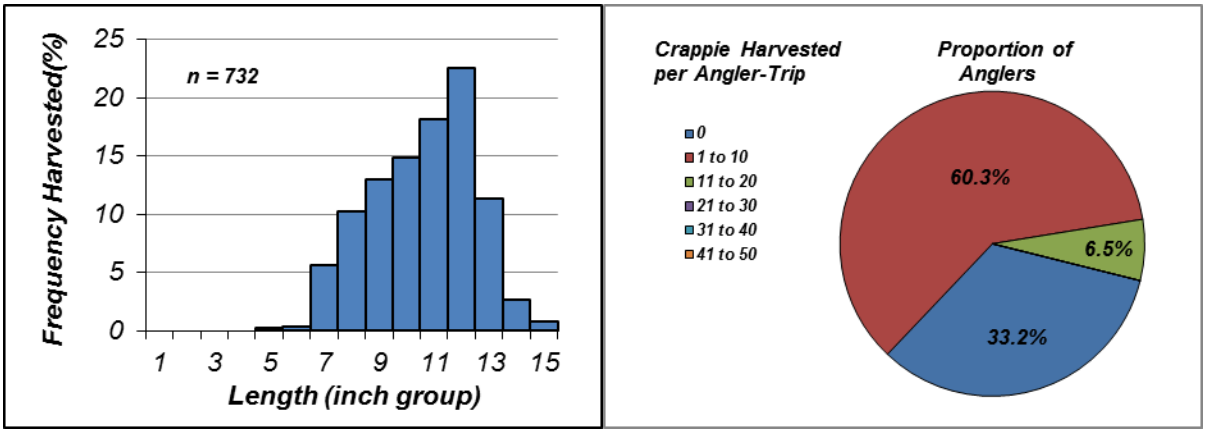


Figure 6. Size frequency of crappie harvested and catch per angler-trip for D'Arbonne Lake crappie anglers derived from the creel survey conducted in 2011. There were no anglers interviewed that harvested over 20 crappie.

Population simulations illustrating the effects of two theoretical size regulations were calculated. Using the mortality rate (77%) determined for D'Arbonne Lake, anglers would be required to release 82% of fish caught with a 10" minimum length limit (MLL). A 12" MLL would require anglers to release 92% of their catch. Harvest per trip would be reduced by 71% with a 10" MLL and 87% with a 12" MLL.

SUMMARY: It is important to note that crappie populations and their fisheries are not only influenced by fishing effort, but also by other anthropogenic and environmental factors. The type and degree of human activity within watersheds and riparian zones can be a significant influence to crappie populations. The recently completed D'Arbonne tainter gates provide increased potential for lake dewatering. Springtime lake dewaterings may negatively impact crappie spawning activity and could potentially decrease crappie production. While consideration of these factors is important in effective fisheries management, evaluating how these factors affect the D'Arbonne Lake crappie population and fishery is beyond the scope of this report.

The D'Arbonne Lake crappie population is equally influenced by natural and fishing related mortalities for a combined rate of 77%. If natural mortality remains constant, no increase in crappie yield should be expected from the protection of a 10" or 12" minimum length limit. Moreover, the required release rates associated with both minimum length limits (82% and 92% respectively) would be poorly received by anglers that pursue crappie for food. The reduction in daily creel necessary for any impact would also have poor angler acceptance. No change could be expected unless the creel limit is lower than the average daily D'Arbonne crappie angler's catch of 2.1 fish per day.

Size distribution, recruitment levels, and fish condition were found to be at levels that indicate a stable and healthy D'Arbonne Lake crappie population. The fishery is currently managed with no size restrictions and a 50 fish per day harvest limit. Given the dynamics of the D'Arbonne Lake crappie population and fishery, no change in angler harvest regulation is recommended.

***Steve Beck and Joe West. 2014. <u>Bayou D'Arbonne Reservoir Crappie: Population and Fishery Characteristics with Size Regulation Simulations.</u> Fisheries Management Section, LDWF.**

APPENDIX C.

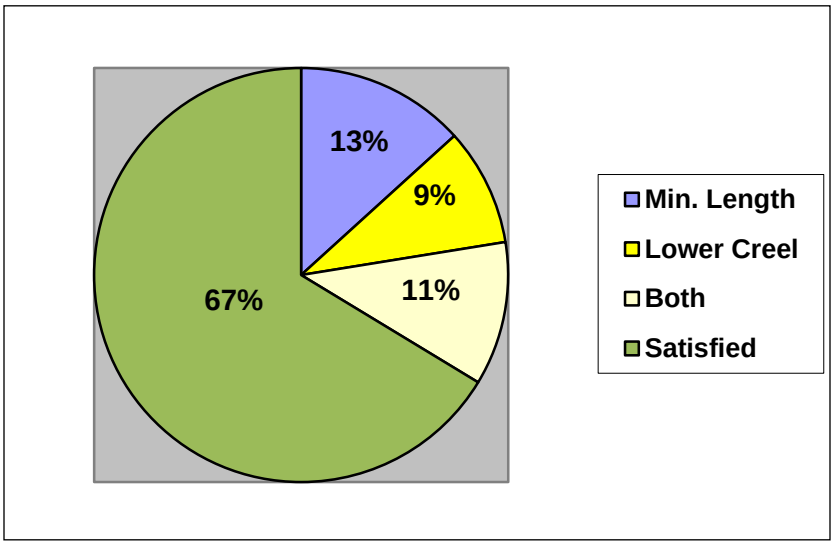
(return to regulations)

Summary of 2009 Crappie Opinion Survey

In 2009, LDWF Inland Fisheries personnel conducted on-the-water interviews of D'Arbonne Lake anglers to gather information about the crappie anglers and to compile opinions related to crappie fishing regulations on D'Arbonne Lake. Refer to the attached survey form for the questions asked of each angler. The attached survey protocol describes the sampling format.

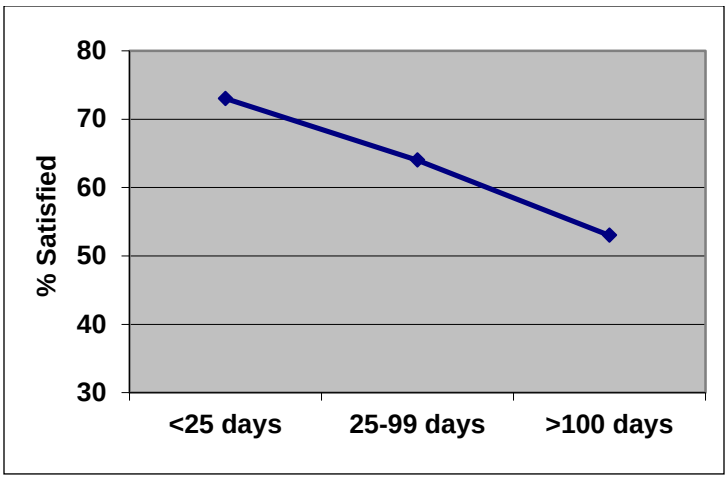
A total of 223 interviews were conducted on 18 randomly selected different dates, with only 7 anglers having been previously interviewed, thus 216 original opinions were obtained. Not all of the 24 scheduled interviews were conducted due to the closure of the lake during high water in both spring and fall, and also because of inclement weather. Overall, 65% of the anglers interviewed were satisfied with the current statewide regulations in effect on D'Arbonne Lake. Of those wanting to see a regulation change, 40% recommended a minimum length, 27% wanted a reduced creel limit, and 33% wanted a combination of both.

Angler Recommendations



Of the anglers interviewed, 23% lived on or had a camp on the lake. Those that did not live or have a camp on the lake travel an average of 33.3 miles to reach D'Arbonne Lake. Mean number of crappie trips per year was 45 for all crappie anglers. This value was inflated substantially by those who lived on the lake, who reported to fish for crappie an average of 81 days each year. Also, only 54% of those living on the lake were satisfied with the current regulations. Satisfaction also decreased among anglers who fished more frequently, with 53% of those who fish over 100 days per year being satisfied. In contrast, 73% of anglers who fished less than 25 times per year were satisfied.

Satisfaction Rate
Anglers Grouped by # Days Fished per Year



Crappie anglers interviewed during the winter fishing season (Jan., Feb., Nov., Dec.) averaged slightly more (54) trips per year and are perceived as being "more serious" about crappie fishing. This group of anglers, though, had the same satisfaction rate as the overall group of crappie anglers.

Of the anglers who specified a preference for minimum length regulations, 79% (n=38) suggested a 10 inch minimum. Other recommendations were as follows:

Min. Length	# of Rec.'s	% of Rec.'s
7"	2	4%
8"	2	4%
9"	3	6%
10"	38	79%
11"	2	4%
12"	1	2%

Of the anglers who specified a lower creel limit, 80% (n=32) wanted a 25 fish limit. Other recommendations were as follows:

Creel Limit	# of Rec.'s	% of Rec.'s
25 fish	32	80%
25 – 30 fish	2	5%
30 fish	5	13%
35 fish	1	3%

Most of the anglers did not give a specific reason or expected benefit for their recommendation, but when prompted to, the most common response was that they believed a restriction would result in a larger average size of crappie. Many anglers also believed that a restriction would result in both larger and more crappie in the lake. Listed below are the different angler responses when asked why they requested a regulation change.

RESPONSES	# of Anglers
Larger average size	14
Larger average size and more fish in the lake	11
More fish will be in the lake	5
A creel limit of 50 is too many	3
Others are keeping too many small fish	2
Texas has a minimum length	2
Better quality fish	2
Protect smaller fish	2
Should be like Poverty Point	1
Should be like Toledo Bend	1
Improve the population	1

The number of original interviews obtained during each month of 2009 is listed below:

January	6
February	38
March	28
April	16
May	0
June	22
July	15
August	20
September	6
October	0
November	41
December	24

APPENDIX D.

2013 D'Arbonne Lake Type Map
(return to typemaps)

D'Arbonne Lake Type Map
2013
Summary of Aquatic Vegetation Survey

Prepared by Ryan Daniel

Inland Fisheries biologists Ryan Daniel and Justin Laughlin surveyed D'Arbonne Lake in Union Parish for all types of aquatic vegetation on August 28 (Little D'Arbonne and Stowe Creek) and Sept. 4 (Corney Creek and Main Lake). Surveys were conducted by traveling the entire shoreline by boat and recording observations on the presence and abundance of all aquatic species onto a lake map. Field notes and map should also be utilized (in addition to this summary) for a more accurate description of the vegetation community. The lake level was approximately 79.0 ft. (pool stage is 80'). D'Arbonne Lake, being a large lake at approximately 16,000 acres, was divided into distinct zones for this survey to better describe the vegetation communities in each of these major areas of the lake. Descriptions of the zones are as follows:

Little D'Arbonne: the western "arm" of the lake, from Gill's Ferry boat launch on Bayou D'Arbonne converge at the far west end to where it opens up into the main lake area north of the Hwy. 33 bridge near the Tech Landing boat ramp.

Corney Creek: the north "arm" formed by Corney Creek, north of the Hwy. 2 Bridge, extending northwest into the natural channel of Corney Creek to Hog Pen Landing including the islands south of Hwy. 2, west of Dozier Creek.

Forks Ferry Area: the open water area immediately north of the Hwy. 33 Bridge where Corney Creek and D'Arbonne Bayou converge, extending north to the Hwy. 2 Bridge and west to the area where D'Arbonne Bayou becomes constricted near the Tech Landing boat ramp.

Main Lake: all areas of the lake south of the Hwy. 33 bridge to the spillway except Stowe Creek

Stowe Creek: above the Hwy. 15 Bridge in Stowe Creek to the Millard Hill Rd. Bridge.

<u>Little D'Arbonne Survey (8/28/13)</u>
Little D'Arbonne is the most vegetated area of D'Arbonne Lake. Submersed aquatic vegetation SAV and emergents are common. Hydrilla *Hydrilla verticillata*, coontail C*eratophyllum demersum*, and muskgrass *Chara sp.* were the most common submersed species in this arm of the lake. All 3 species were common from Tech Landing north to Gill's Ferry launch. Chara formed extensive mats on the shallower flats in the upper end, around islands, and in shallow coves. Coontail and/or hydrilla were growing around much of the western shoreline in depths to nearly 5 feet, though mostly scattered and not forming dense mats. Neither was abundant on the eastern shoreline, where Chara was abundant in much of the shallows. Water willow *Justicia*

americana was common along much of the immediate shoreline and around islands. American lotus *Nelumbo lutea* and American pondweed *Potamogeton nodosus* were the most abundant emergent species. The lotus formed expansive mats in several locations, with the largest at Cypress Island, and the pondweed was most abundant in the shallows of the upper end. Lotus was common in north end to channel proper, 1 mile South of Gill's Ferry. Water primrose *Ludwigia uruguayensis* was also found in some of the shallower areas, especially farther north. The "flats" in the upper end consisted of American lotus, American pondweed, water primrose, and Chara.

Corney Creek Survey (9/4/13)

Chara (SAV) and primrose were the dominant species in Corney. Coontail and southern naiad *Najas sp.* were also found in shallow water adjacent to the shoreline, but in only a few locations. No hydrilla or American lotus was observed in the Corney arm. Primrose was common in the backs of coves and around shallow islands, forming large mats in the upper end, especially in Boatwright Creek. Primrose was also growing along the shore where channel becomes confined north of last channel marker. Filamentous algae was common around islands and in coves of upper Corney. Very little vegetation was observed in the Corney Flats area and islands on the south side of Hamilton Field. The islands on the south side of Hwy. 2 had primrose growing along the shore, though rarely extending beyond 5 feet in depth. Other than primrose, vegetation was not significant around these islands.

Forks Ferry Area Survey (8/28/13)

This area of the lake was void of any significant vegetation. Waterwillow was present on the shoreline in a few locations. Hydrilla was present, though not problematic in the shallower areas on the western side of this open area.

Stowe Creek Survey (8/28/13)

The vegetation in this area consisted primarily of primrose mats in the shallows. Primrose formed a near solid mat in the upper east arm of Stowe Creek and in the large cove on the south/west side of Stowe. Chara and coontail were scattered on the west shore and upper end. The eastern shore was mostly void of vegetation other that some primrose on the immediate shoreline. No hydrilla was observed.

Main Lake (9/6/13)

The main lake area south of the Hwy. 33 Bridge continues to have insignificant coverage of vegetation. A non-problematic amount of primrose was seen in upper Bear Creek and in the backs of other small coves. No hydrilla was observed.

Overall Summary

The fall/winter drawdown of 2012 has reduced SAV, including hydrilla, to non-problematic amounts, with very few dense mats. Hydrilla was found scattered on approximately 5.5 miles of shoreline total (see Darbonnehydrilla2013 map), mostly in depths less than 5 ft. Assuming an average growth of 30 ft. from shoreline, there is an estimated 20 acres of hydrilla currently in the lake. It was only observed in the D'Arbonne arm during 2013. Coontail was common, though not abundant in any area. Chara is the dominant SAV in much of the shallows. It is currently the most abundant submerged species, forming dense mats in the depths less than 2 feet in Corney, Little D'Arbonne, and Stowe Creek. The lotus field in the Cypress Island area appears to be expanding. Current coverage extends from Tech Lane to Cypress Lane. LDWF is continuing to treat nuisance patches of lotus with herbicides. SAV coverage is less than 10% lakewide, while

emergent coverage is restricted to protected shorelines, coves, and the shallows primarily in D'Arbonne, Corney, and Stowe Creeks. American lotus may be the most problematic species on D'Arbonne in 2013, with several complaints being made by homeowners in the Little D'Arbonne area. Bladderwort *Utricularia spp*. and fanwort *Cabomba caroliniana* were not observed in 2013.

*Maps showing coverage and location of hydrilla and lotus are shown in:
Darbonnehydrilla2013 and Darbonnelotus2013 files

Species List

Submersed Aquatic Vegetation (most to least abundant)
Hydrilla *Hydrilla verticillata*
Chara *Chara sp.*
Coontail C*eratophyllum demersum*
Southern pondweed *Najas sp.*

Emersed Aquatic Vegetation
Water Primrose *Ludwigia uruguayensis*
Water Willow *Justicia americana*
American Lotus *Nelumbo lutea*
American Pondweed *Potamogeton nodosus*

Floating Aquatic Vegetation
Filamentous Algae *Pithophora sp.*
Water hyacinth *Eichhornia crassipes*